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## A REVIEW OF *Callophrys affinis* (W. H. EDWARDS), WITH DESCRIPTIONS OF TWO NEW SUBSPECIES FROM NEW MEXICO AND MEXICO

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**ABSTRACT:** The subspecies of *Callophrys affinis* (W.H. Edwards) are discussed, with emphasis on biosystematics, ecology and distribution. *C. apama* (W.H. Edwards) is treated as a subspecies and two new subspecies are figured and described from New Mexico and Mexico.

**Additional key words:** allopatric, sympatric, submesial band (=macular band; postmedian line), ecotype

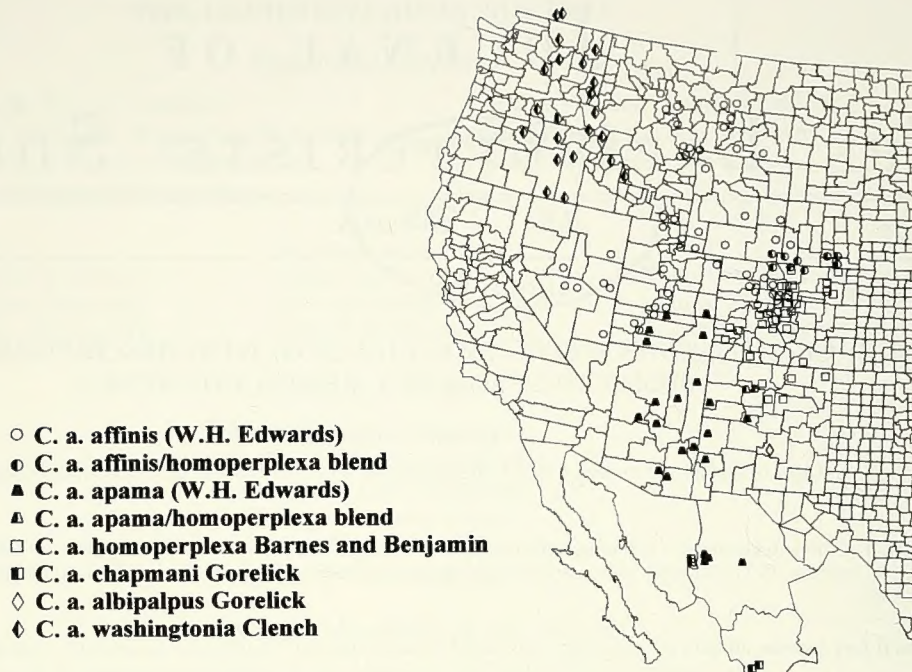
The holarctic genus *Callophrys* Billberg, thecline lycaenids recognized by the absence of a tail and green scaling on the undersides of the wings, is widely represented in western North America by the *C. affinis* (W. H. Edwards) and *C. sheridanii* (W. H. Edwards) complexes. Species of the *C. sheridanii* complex are characterized by a complete or nearly complete submesial band of predominantly white-scaled maculations on the hindwing undersides. This complex includes nominate *C. sheridanii* (W.H. Edwards), *C. lemberti* Tilden, and *C. comstocki* Henne. Members of the *C. affinis* complex, on the other hand, are recognized by significant intrapopulation variation in the shape and relative completeness of the submesial band on the ventral hindwings. This complex includes *C. affinis* (W.H. Edwards); *C. apama* (W.H. Edwards), treated here as a subspecies of *C. affinis*; *C. dumetorum* (Boisduval), synonymous with *C. viridis* (H. Edw.) (Emmel *et al* 1998); and *C. perplexa* (Barnes & Benjamin), formerly *C. dumetorum* (Bdv.) (Emmel *et al* 1998). Gorelick (1971) treated the members of these complexes as a superspecies (as defined by Mayr 1965) although the study described herein suggests otherwise.

Populations of *Callophrys affinis* (W. H. Edwards) occur throughout western North America as shown by Stanford & Opler (1993). Life histories of the described subspecies were published by Scott (1986). They typically occur in the Transition zone, including steppe habitats. The localities of adult specimens used in this study are depicted in Figure 1. These butterflies are on the wing between April and September, typically in

mountain or steppe habitats between 1372–2500m throughout the species range. Like other *Callophrys* (s. str.), some variation may exist in the iridescent color of the green scaling on the ventral surfaces of the hindwings. This variation relies on light interaction with detailed scale architecture to yield the green color, rather than pigment (Ghiradella 1989). The function of this appears to be thermoregulatory (Gorelick 1971).

The most readily chosen diagnostic characteristic examined in the *C. affinis* complex has typically been the number and arrangement of the white maculations composing the submesial band (Clench 1944, Tilden 1963, Ferris 1971a). Owing to substantial adult variation (intrapopulation, ecotypic and clinal), the most revealing taxonomic studies of *Callophrys* also include life cycle observations, flight period(s), mating and oviposition behavior, as well as habitat and hostplant descriptions (Gorelick 1971, Emmel *et al* 1998). First instar and mature larvae of *Callophrys* taxa and other closely related thecline lycaenids are described and figured by Ballmer and Pratt (1988, 1992).

Biological and systematic studies of *Callophrys* species are limited in number, perhaps due to the dearth of exploration in geographically isolated mountain ranges in both the southwestern United States and northern Mexico. Since the 1960s, searches in these areas have resulted in new *Callophrys* distribution records (Clench 1965, Gorelick 1971, Ferris and Brown, 1981, Mueller 1982, Cary and Holland 1992, Brown *et al* 1992, Hinchliff 1994, 1996). Bailowitz and Brock (1991) mention the occurrence of



- *C. a. affinis* (W.H. Edwards)
- *C. a. affinis/homoperplexa* blend
- ▲ *C. a. apama* (W.H. Edwards)
- △ *C. a. apama/homoperplexa* blend
- *C. a. homoperplexa* Barnes and Benjamin
- *C. a. chapmani* Gorelick
- ◇ *C. a. albipalpus* Gorelick
- ◆ *C. a. washingtonia* Clench

FIG. 1. Distribution of *Callophrys affinis* (W. H. Edwards)

*C. affinis apama* in the Santa Catalina Mountains of southeastern Arizona with respect to this apparent isolation. Such isolation is also seen in such areas as the La Sal Mountains of eastern Utah, shrub-laden arroyos and prairie breaks of Huerfano, Lincoln/Washington and Crowley counties in eastern Colorado (Stanford 1994), southwestern Nebraska, the Sacramento Mountains of southern New Mexico, and the Sierra Madre Occidental of northern Mexico. Adult populations of this species were found to be relatively abundant with considerable variation in the northern and central portions of its range, but scarcity and relative loss of variation were observed in the southernmost montane portion of its range in northern Mexico.

#### SYSTEMATICS

First in the *C. affinis* species group to be described was *Thecla dumetorum*, named by Boisduval (1852). He believed *C. dumetorum* to be a local race of the European species, *T. rubi* L. (Gorelick 1971). The taxa *Thecla affinis* and *Thecla viridis* were described by William Henry Edwards in 1862. In 1882, William Henry Edwards described *Thecla apama* on the basis of white maculations of the ventral hindwings (VHW) lined with a reddish brown band. F.M. Brown (1970) designated a lectotype for this species and referred to

five specimens deposited in the AMNH that are probably paratypes. After incorporation into the genus *Callophrys*, a second subspecies, *C. apama homoperplexa*, was named by Barnes and Benjamin (1923) from Colorado on the basis of significant "reduction of white lines and their corresponding black and brown bands, the spots being usually quite disconnected." Barnes and Benjamin correctly pointed out that the total absence of these white spots or maculations on the wing undersides in females renders them quite similar to *Callophrys dumetorum perplexa* from San Diego, described by them in 1923. Unlike other *C. affinis* complex members, females of *C. perplexa* are distinct in their dorsally brown to golden brown wing scaling and grass green to golden green-scaled ventral hindwings. They also implied the necessity of examining a significant number of specimens from each locality to best insure proper identification of *C. apama* subspecies due to the existence of "intermediates to typical *C. apama*."

Haskin and Grinnell (1912) treated *Thecla dumetorum* (Bdv.), *T. viridis* (W. H. Edw.), & *T. affinis* (W. H. Edw.) as synonyms. Succeeding publications list these species as separate taxa (Klots 1951, dos Passos 1964, Howe 1975, Miller & Brown 1981). In his study on the genus *Callophrys* in North America, Clench (1944) presented a key to the species wherein he separated *C. apama* from *C. perplexa* (formerly *C. dumetorum*) (Emmel *et al* 1998) on the basis of the

convexity of the outer margin of the forewing. Subspecies were principally identified by use of these white maculations on the hindwing undersides, and a new taxon, *C. affinis washingtonia*, was described from Washington. More recently, Pyle (2002) treats *C. perplexa* and *C. affinis* as separate taxa, as do Brock & Kaufmann (2003), and Opler & Warren (2003).

The variability of *Callophrys affinis* adults is well described by Ferris and Brown (1981), who treated *C. apama* as a separate species. The diagnostic characteristics and intrapopulation variation discussed sufficiently separate *C. apama* from closely allied *C. affinis*. They also described the appearance of the submesial band of white spots on the ventral hindwing (VHW) in some Rocky Mountains specimens as varying from a nearly continuous irregular line to those in which such white spots are virtually absent. This description applies to specimens from large populations that were studied from Boulder and Jefferson counties, Colorado, which are treated here as *C. affinis homoperplexa*. Using ventral hindwing features, phenotypic intermediates between *C. affinis affinis* and *C. affinis homoperplexa* in Wyoming, Colorado and Nebraska suggest intergradation. Recognizing this intergradation, Scott (1986) was the first to treat both *homoperplexa* and *apama* as subspecies of *C. affinis*.

In their treatment of the butterflies of New Mexico, Toliver *et al* (1994), Cary and Holland (1992), Holland and Cary (1996) list *C. apama* from the Jemez and Sangre de Cristo ranges of northern New Mexico as *C. apama homoperplexa*. This was confirmed by eight specimens collected by the author in late May and early June of 1996. Nevertheless, all four specimens reared from four second generation larvae taken from the Jemez Mountains emerged in August 1997 with a nearly complete submesial band more typical of *C. affinis apama* (Fig. 2), also suggesting intergradation. Two paratypes of "*Thecla apama homoperplexa*" also have a nearly complete submesial band with abundant brown scaling on the mesial side of the white maculations on the VHW, like that shown in figure 3.

#### MATERIALS AND METHODS

Ecological and behavioral observations were conducted in the state of Durango (Mexico), and in selected localities in Coconino Co., Arizona, Lincoln Co., New Mexico, Albany Co., Wyoming and Cheyenne Co., Nebraska, between 1981 and 1997 to gather comparative biosystematic information. On these trips, adults, immature stages, larval hostplants, and soil samples were collected. Field notes and photos were taken, including habitat descriptions and hostplant selections, as well as mating and ovipositional behaviors.

Live immature stages were transported in an ice chest by automobile and live females were shipped by overnight express within twelve hours of their capture to Dr. John Emmel, Hemet, California. In this manner, newly-eclosed adults emerged from ova obtained by oviposition in a lab setting using closely related hostplants. In addition to the rearing of immature stages, 12 *C. a. apama* ova and first instar larvae were examined using a stereoscopic microscope.

No fewer than 12 first instar larvae of *C. a. apama* were collected and preserved in a larval fixative solution, along with a similar number of mature larvae. These and the field-collected adults are currently housed in the author's personal collection.

In most cases, observations were made on flights of a minimum of 12 individual adults at a given roadside or trailside locality, mostly during 2nd generation flight periods. Such observations of *C. affinis* were conducted on both sides of the Continental Divide. On the west side of the Mogollon Plateau, a portion of the Colorado Plateau characterized by Hubbard (1965), *C. affinis* populations were studied at four localities: base of San Francisco Peaks, north of Flagstaff in north-central Arizona, 2287m; the vicinity of Rose Peak, Apache National Forest in southeastern Arizona, 2287–2439m; the Zuni Mountains of western New Mexico, 2287–2317m; and the Sierra Madre Occidental west of Durango, Mexico, 2287–2439m.

On the east side, studies were conducted on isolated limestone outcrops with silt-laden sandstone layers and in cherty limestone/volcanic ash arroyos that occur in northeastern Colorado and southwestern Nebraska, 1372–1524m, and in the Sacramento Mountains of south-central New Mexico, 2287–2317m.

Using both field-collected and reared adult specimens, selected body and wing characteristics were compared. The characteristics chosen for comparison generated the nominal data entered in Table 1.

#### RESULTS

Ova are disc-shaped with abundant, variably shaped trabeculae. Green in color, the ova were found to be similar in size and texture to those described for *Callophrys perplexa* (= *dumetorum*) and *C. dumetorum* (= *viridis*) (Gorelick 1971, Emmel *et al* 1998) and for *C. sheridanii* (Ferris 1973). No changes in color occurred up to the day of eclosion.

Intrapopulation variation in the submesial band of ventral hindwing maculations was found to conform to the following generalizations along a north to south gradient:

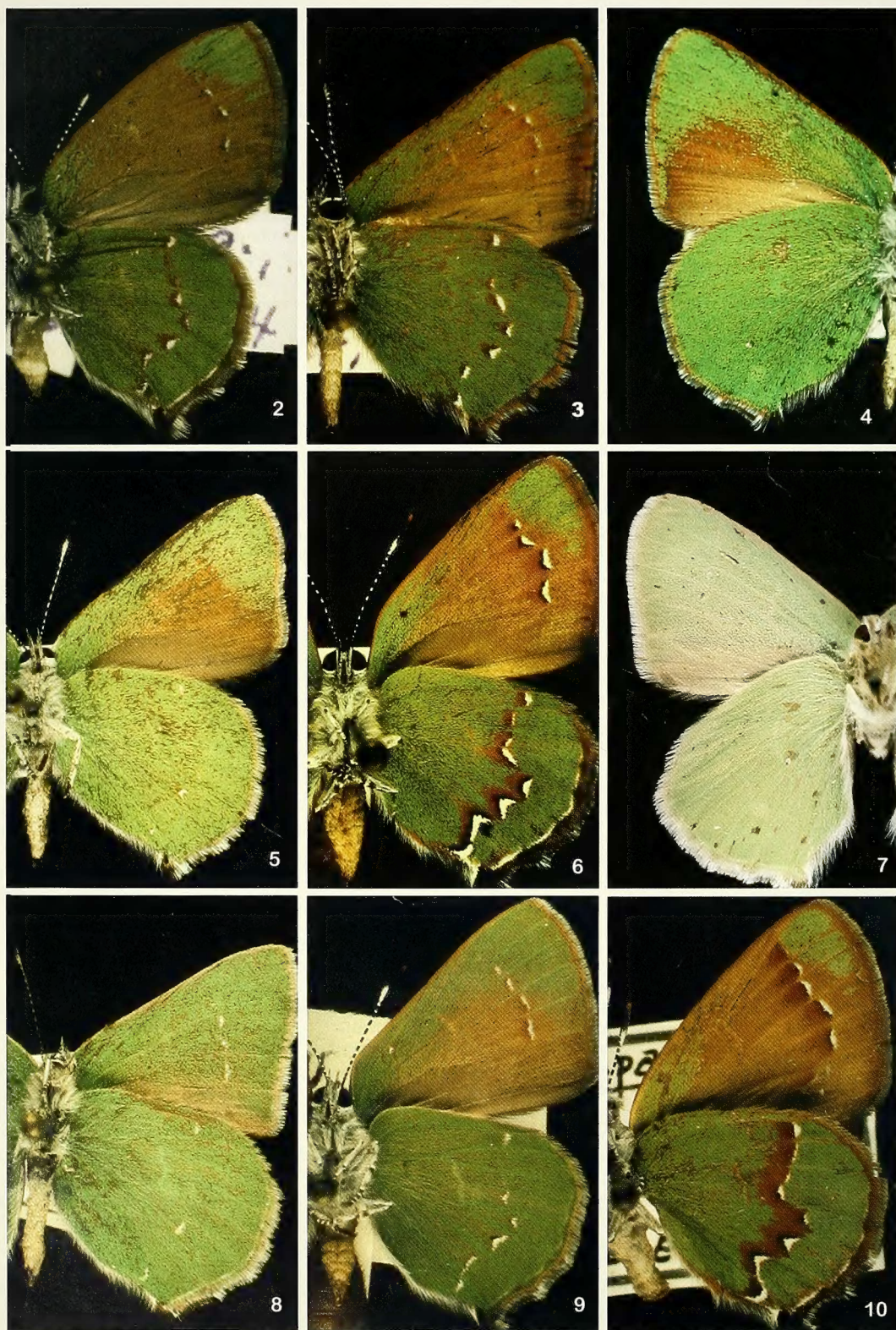
1. Specimens taken in northern Colorado (Larimer, Weld counties), southwestern Nebraska (Banner and

TABLE 1: Characters used in the analysis of the *Callophrys affinis* complex in the western United States and Mexico

| CHARACTER                      | Subspecies of <i>Callophrys affinis</i> :   |  |   |  |  |  |   |   |
|--------------------------------|---|--|---|--|--|--|---|---|
|                                | <i>apama</i>  | <i>chapmani</i>  | <i>apama</i> x<br><i>homoperplexa</i>                   | <i>homoperplexa</i>                                | <i>albipalpus</i>  | <i>affinis</i> x<br><i>homoperplexa</i>                              | <i>washingtonia</i>                                 | <i>affinis</i>  |
| 1. VHW vein tips: M3-2A        | outer-brown; mesial-black; inner-white  | outer-brown; mesial-dark brown; inner-white  | uniform brown   | uniform brown                                      | outer-brown; inner-white (very weak)                         | uniform light brown  | uniform pale to light brown                         | uniform pale to light brown                               |
| 2. VHW margin - females        | prominent intervenous white line; outside green scaling, M3 to 2A                             | prominent intervenous white line; outside green scaling, Cu1 to 2A                       | intervenous white line outside green scaling, Cu1 to 2A | white line typically absent                        | white line thin; weakly developed                            | intervenous white line absent  | intervenous white line absent                       | intervenous white line absent                             |
| 3. Wing fringes: VFW           | basally gray brown; mesially light brown; distally pale-tipped                                | basally light brown; mesially gray brown; distally pale                                  | basally dark brown; distally pale                       | basally brown; distally pale                       | basally brown; distally pale                                 | basally light brown; distally pale                                   | basally light brown; distally white                 | basally brown; distally pale to white                     |
| VHW: M1-Cu2                    | basally brown; mesially dark brown; distally pale to white                                    | basally brown; mesially gray brown; distally mixed pale                                  | basally brown; distally pale                            | basally brown; distally pale to white              | basally brown; distally pale to white or mixed               | basally light brown; distally pale                                   | basally light brown; distally pale                  | basally brown; distally pale to white                     |
| VHW: 2A-3A                     | distally dark brown; mesially white; distally dark brown; elongated white scales at vein tips | distally brown; mesially white; distally dark brown; elongated white scales at vein tips | basally brown; mesially white; distally dark brown      | basally brown; mesially white; distally dark brown | basally brown; mesially white (reduced); distally dark brown | basally light brown; mesially white (prominent); distally dark brown | basally light brown; mesially white; distally mixed | basally light brown; mesially white; distally light brown |
| 4. FW apex                     | obtuse-angled   | obtuse-angled  | obtuse-angled   | obtuse-angled                                      | obtuse-angled  | slightly obtuse-angled   | nearly pointed                                      | nearly pointed  |
| 5. FW outer margin: male       | slightly crenated between Cu1 & M3  | as in <i>apama</i>   | as in <i>apama</i>                                      | as in <i>apama</i>                                 | as in <i>apama</i>   | as in <i>apama</i>   | nearly right-angled                                 | nearly right-angled                                       |
| female                         | slightly rounded  | slightly rounded   | slightly rounded  | slightly rounded                                   | slightly rounded   | nearly right-angled  | nearly right-angled                                 | nearly right-angled                                       |
| 6. VFW costa                   | pale brown to yellowish, concolorous  | brown to yellowish, concolorous  | light brown   | light brown  | light brown  | light brown  | gray  | grayish   |
| 7. VFW coloration inner margin | light brown to Cu2; brown above   | light brown to Cu2; brown above  | light brown to Cu2; brown above                         | typically grayish to Cu2; light brown above        | grayish to Cu2; light brown above                            | grayish to M2  | gray to Cu2; mostly green                           | gray from inner margin to Cu2; mostly green               |
| 8. Antennal annuli             | 15-16   | 16-17  | 16-17   | 17-18  | 16-17  | 16-17  | 17 mostly white                                     | 17  |
| 9. Facial hair tuft            | typically bent forward; thicker laterally   | as in <i>apama</i>   | as in <i>apama</i>                                      | as in <i>apama</i>                                 | as in <i>apama</i>   | sparse; bent forward   | sparse; bent forward                                | sparse; prostrate   |
| scale color                    | mixed gray and brown  | as in <i>apama</i>   | light gray  | light gray   | light gray to white  | light gray   | white to gray                                       | white to gray   |
| 10. FW stigma - male           | lighter than ground color   | lighter than ground color  | typically concolorous                                   | typically concolorous                              | lighter than ground color                                    | typically concolorous  | typically concolorous                               | typically concolorous                                     |

TABLE 1: Continued

| CHARACTER                                  | Subspecies of <i>Callophrys affinis</i> :   |   |  |   |  |   |   |   |
|--|---|---|--|---|--|---|---|---|
|  | <i>apama</i>  | <i>chapmani</i>   | <i>apama</i> x<br><i>homoperplexa</i>  | <i>homoperplexa</i>   | <i>albipalpus</i>  | <i>affinis</i> x<br><i>homoperplexa</i>   | <i>washingtonia</i>   | <i>affinis</i>  |
| 11. Labial palp scaling                    | black dorsally; white laterally   | black dorsally; white laterally   | black dorsally; white laterally  | black dorsally; white laterally                                     | black dorsally; white laterally  | some black; mostly white  | mixed black and white   | thin; mixed black and gray  |
| ventral setae                              | thick; black; abundant  | thick; black; abundant  | thick; black; abundant   | thick; black; abundant  | black; abundant  | black; mixed with white scales  | black; mixed with white scales  | black; mixed with white scales  |
| distal segment                             | black; white-tipped   | typically tricolored: black with 4-5 brown scales ventrally; white-tipped                         | black; white-tipped  | typically black; white-tipped                                       | typically white; white-tipped  | mostly black; white-tipped  | white; white-tipped   | mixed black and white   |
| 12. Green scaling-VHW (Kelly & Judd, 1976) | bright (emerald) green  | typically olive green in males; strong (dark) green in females                                    | 1st generation: bright green<br>2nd generation: bright to yellow green                       | bright green  | 1st generation: moderate to bright green<br>2nd generation: bright green   | slightly yellowish green  | light green   | pale to yellow green  |
| 13. Maculations VHW                        | complete band; maculations in Cu1 & Cu2 displaced laterally; tricolored-white, black, and brown | complete band & tricolored as in <i>apama</i> ; mesial brown scaling also forms a contiguous band | nearly complete; maculations in M1-M3 may be absent; black scaling weak (12 or fewer scales) | typically incomplete; variable; mesial black scaling weak or absent | 1st generation: absent in females<br>2nd generation: typically complete or nearly complete - M2 to 3A only<br>2nd generation (males): inner brown scales reduced to 8 or fewer; black scaling absent | variable; both black and brown scaling absent in males; brown scaling absent in females | typically one spot in cell Cu2; brown scaling absent; black scaling greatly reduced to fewer than 12 scales or absent | typically absent or one spot in cell Cu2; nearly complete-M2 to 3A in some; black scaling reduced to fewer than 12 scales or absent |
| VFW  | 4-5 maculations prominent white; black mesially   | 4-5 maculations weakly black mesially   | 3-4 weakly developed or absent; contrasting brown scaling mesially                           | 4-5 weakly developed or absent; contrasting brown scaling mesially  | 4 weakly developed or absent; contrasting brown scaling mesially   | 4 or fewer; greatly reduced or absent   | 4 or fewer; greatly reduced or absent   | 2 or fewer; greatly reduced or absent   |
| 14. Dorsal features male                   | grayish to brown  | grayish brown   | brown to orange brown  | brown to orange brown   | brown to orange brown  | orange brown  | grayish brown   | grayish   |
| female                                     | orange brown with dark brown margins  | as in <i>apama</i>  | as in <i>apama</i>   | as in <i>apama</i>  | as in <i>apama</i>   | as in <i>apama</i>  | uniform orange brown  | uniform orange brown  |



FIGS. 2-10: *Callophrys affinis* subspecies from the U. S. and Mexico. 2. *C. affinis apama* x *homoperplexa* blend, ♂, Jemez Mountains, Los Alamos Co., NM. 3. *C. affinis homoperplexa*, ♂, Boulder Co., CO. 4. *C. affinis homoperplexa*, ♂, Jefferson Co., CO. 5. *C. affinis affinis* x *homoperplexa* blend, Albany Co., WY. 6. *C. affinis apama*, ♂, Coconino Co., AZ. 7. *C. affinis affinis*, ♂, Box Elder Co., UT. 8. *C. affinis washingtonia*, ♂, Goose Lake, British Columbia, Canada. 9. *C. affinis albipalpus*, n. ssp. holotype ♂, Lincoln Co., NM. 10. *C. affinis chapmani*, n. ssp. allotype ♀, Durango, Mexico.

Cheyenne counties) and southeastern Wyoming (Laramie Range, Albany County) showed wide variation in the submesial band. Most males examined (31 of 38, 81.6%) exhibited up to six maculations with both brown and black scaling, while 7 (18.4 %) females exhibited a complete band that lacked brown scaling. In the Laramie Range, specimens treated as *C. a. homoperplexa* by Hardesty & Groothuis (1993) had slightly-pointed forewing apices that more resembled those of *C. affinis affinis*. Similarly, the southwestern Nebraska specimens thus appear to be intergrades between these two taxa, as suggested by Scott & Scott (1980) & Scott (1986).

The phenotypic intermediates in Wyoming were studied on the eastern edge of the city of Laramie in a ravine dominated by *Cercocarpus* shrubs along with scattered *Juniperus*. Stands of *Cercocarpus montanus* Raf. were found to be the preferred male perching sites between 1 and 4 PM. Despite numerous stands of the flowering larval hostplant, *Eriogonum flavum* (Table 2) in this ravine, adults of these intermediates do not occur in most years (C. Ferris pers. com.). Their relative scarcity was also noted during this study, a fact that rendered a reliable comparison of macular band scaling between this population and other populations in Albany and Laramie counties, Wyoming, and Weld County, Colorado inconclusive. A total of 12 of 12 males (100%) from these localities lacked brown and black scaling mesial to the white maculations.

2. Only 18 of 221 (8%) specimens examined from localities in Colorado (Denver southward) and New Mexico (Albuquerque northward) possessed a nearly complete white band bearing more than 12 black scales in each maculation (Fig. 3). The majority (203, 92%) possessed six or fewer white maculations that included eight or fewer black macular scales (Fig. 4). Intergradation between *C. affinis apama* (Fig. 6) and *C. a. homoperplexa* in eastern Wyoming and southwestern Nebraska (Fig. 5) also occurs in the Jemez Mountains of northern New Mexico (Fig. 2). A lack of sympatry exists between *C. affinis affinis* (Fig. 7) and *C. a. apama* in Arizona, as shown by Scott (1986). This lack of sympatry probably led to earlier treatments of the two taxa as separate species. Sympatry with *C. a. affinis* is also absent within the known range of *C. affinis washingtonia* in the Pacific Northwest (Guppy and Shepard 2001) (Fig. 8) yet *C. a. affinis* is narrowly sympatric with *C. perplexa* in Washington (Hinchliff 1996).

3. In southwest Colorado, sharp VHW maculation differences were found to occur within and between populations. These varied from only a few VHW white maculations typical of *C. affinis homoperplexa* (16 of 23

specimens, 70%) to those with more prominent brown-bordered maculations, indicative of *C. affinis apama* (7 of 23 specimens, 30 %).

4. In New Mexico (southwest of Albuquerque), Utah, and Arizona, most of the specimens examined (142 of 145, 98%) possessed a complete or nearly complete black-and brown-bordered macular band that exhibited little variation, typical of *C. affinis apama*.

5. Specimens from a population in the Sacramento Mountains near Ruidoso (Lincoln County, New Mexico), lacked hindwing maculations or exhibited an incomplete, curved macular band lacking in brown scaling or containing 12 or fewer brown scales in each. This was seen in 15 of 20 (75%) specimens (Fig. 9). This brown macular scaling was very greatly reduced or absent in both sexes, as were black macular scales in 19 of 20 specimens (95%). One male and one female examined from two localities in the southern portion of the Sacramento Mountains (Otero County, New Mexico) possessed a complete macular band typical of *C. a. apama* yet its hostplant, *C. fendleri* A. Gray, is absent from these localities. These two specimens from the first decade of the 20th Century bore incomplete collection data and no further sightings or captures of completely banded specimens have been recorded from the Sacramento Mountains.

6. A complete submesial white band was exhibited by all specimens seen from the Sierra Madre Occidental range of Sonora, Chihuahua, and Durango states (21 of 21, 100%). This feature was also accompanied by a darker green scale color on the VHW surfaces (Fig. 10) except on Chihuahua specimens, which exhibited a VHW green color similar to that seen in typical *C. affinis apama* from Arizona and New Mexico (15 of 15, 100%). The contiguous brown scale border of the submesial band was notably wider, more like that seen in specimens from the state of Durango. These specimens suggest discontinuous distribution in *C. a. apama*.

In summary, populations west of the Continental Divide and south of Utah should now be treated as *C. affinis apama* with a complete macular band and a nearly complete brown border to this band. These tend to exhibit a relative loss of maculations east of the Continental Divide suggesting possible clinal variation from west to east. Variable specimens from southwestern Nebraska, southeastern Wyoming and northern Colorado suggest local breakdown of this pattern. The populations of *C. affinis* studied east of the Continental Divide with respect to the VHW submesial band appear to be local adaptations (ecotypes) that most closely resemble *C. affinis homoperplexa*. Using both reared and field-collected specimens, consistent

structural differences were found to exist in adult specimens of *C. affinis* from the Sierra Madre Occidental in the states of Sonora and Durango and the Sacramento Mountains of New Mexico. Such differences were noted in the labial palps as well as on the ventral hindwings. These character differences suggest two rather distinct populations that are now, using both structural and biological features, designated as new subspecies:

***Callophrys affinis albipalpus* ssp. nov.**

(Figs. 13, 14)

**Description: holotype male: Head:** Antennae black with 16 white annuli; distal three white annuli contiguous ventrally; club annuli black, orange brown distally; basal segment black with a single white maculation laterally; labial palp scaling black dorsally, white laterally, with distal segment predominantly white with white tip. **Dorsal surface of forewing:** FWL = 12.1 mm. Ground color uniform orange brown with contrasting brown venation and light brown stigma; outer margin dark brown with bicolored wing fringe (basally brown, distally white). **Dorsal surface of hindwing:** Ground color, outer margin and fringe as in forewing; fringe tricolored between vein 2A and 3A (basally brown, mesially white, distally dark brown). **Ventral surface of forewing:** Ground color grayish from posterior margin to vein Cu2; light brown to vein R5; abundant scattered bright green scaling between vein R5 and costa; incomplete band of five laterally-displaced submesial white maculations between veins R4 and Cu1; two maculations with very weak black scaling mesially; apical region to vein Cu1 lateral to submesial maculation with bright green scaling; outer margin brown with bicolored fringe (basally gray brown, distally pale). **Ventral surface of hindwing:** Ground color bright green with an incomplete submesial band of six white maculations displaced laterally between veins Cu1 and 2A; basal brown scaling in each maculation weakly developed; mesial black scaling significantly reduced to three or fewer scales or absent; outer margin as in forewing; anterior portion of fringe bicolored (basally light brown, distally pale); tricolored between veins 2A and 3A (basally light brown, mesially white, greatly reduced, & distally dark brown).

**Allotype female: Head:** Antennae as in holotype male with 17 white annuli; labial palp scaling mostly white; distal segment predominantly white with white tip. **Dorsal surface of forewing:** FWL = 12.5 mm. Ground color orange brown with 1.2 to 1.5 mm wide dark brown outer margin; wing venation and fringe as in holotype male. **Dorsal surface of hindwing:** Ground color as in forewing, with dark brown outer margin narrower than 0.5 mm; venation and fringe as in forewing; mixed brown and white scales between veins 2A and 3A. **Ventral surface of forewing:** Ground color as in holotype male, with brown scaling reaching the costal vein; submesial maculations absent; apical and subapical region very weakly green; fringe light brown basally; pale distally. **Ventral surface of hindwing:** Ground color as in forewing; incomplete submesial band with five white maculations; maculations with reduced brown scaling basally; mesial black scaling greatly reduced to three or fewer scales per maculation; outer margin brown with white scales forming a line between veins Cu1 and 2A; fringe as in holotype male.

**Types.** All type specimens were collected in the Sacramento Mountains of Lincoln County, New Mexico. The holotype male and allotype female were reared from a 1st generation female taken at the New Mexico State University's Montgomery Biological Research Laboratory (now privately owned property), 10 km north of Ruidoso, 2134m, Sacramento Mountains on June 28, 1982. They emerged in August 1982. Twelve paratypes (6 ♂, 6 ♀) bear the same data as the holotype male and allotype female. Additional paratypes were collected at the type locality on VII-4-1981 by the author (2♂, 4♀) and 1♂ reared *ex ovum* in 1982. Other field-collected paratypes include 2 males from Cedar Creek Camp, 10 km north of Ruidoso, 2134m, Sacramento Mountains, VI-30-1961, F. P. & J. Rindge, collectors

(Carnegie Museum). The holotype male and allotype female and seven paratypes will be deposited in the Natural History Museum of Los Angeles County, Los Angeles, California. Two paratypes will be deposited at each of the following institutions: Florida Museum of Natural History, American Museum of Natural History, California Academy of Sciences, Carnegie Museum of Natural History, National Museum of Natural History, Essig Museum of Entomology (University of California, Berkeley). One paratype has been placed in the Entomology Research Museum (University of California, Riverside) and one remains in the collection of the author.

**Etymology.** The name given to this new taxon describes the dominant white scaling on the distal segment of the labial palpi observed in 18 of 20 (90%) specimens of both sexes, both reared and field-collected.

**Diagnosis.** Males and females of *C. a. albipalpus* typically exhibit predominantly white scaling along the labial palps. The distal segment is entirely white. This trait, along with the absence of black scaling along the submesial band of the ventral hindwing, distinguishes this taxon from its closest allies, *C. a. apama* and *C. a. homoperplexa*.

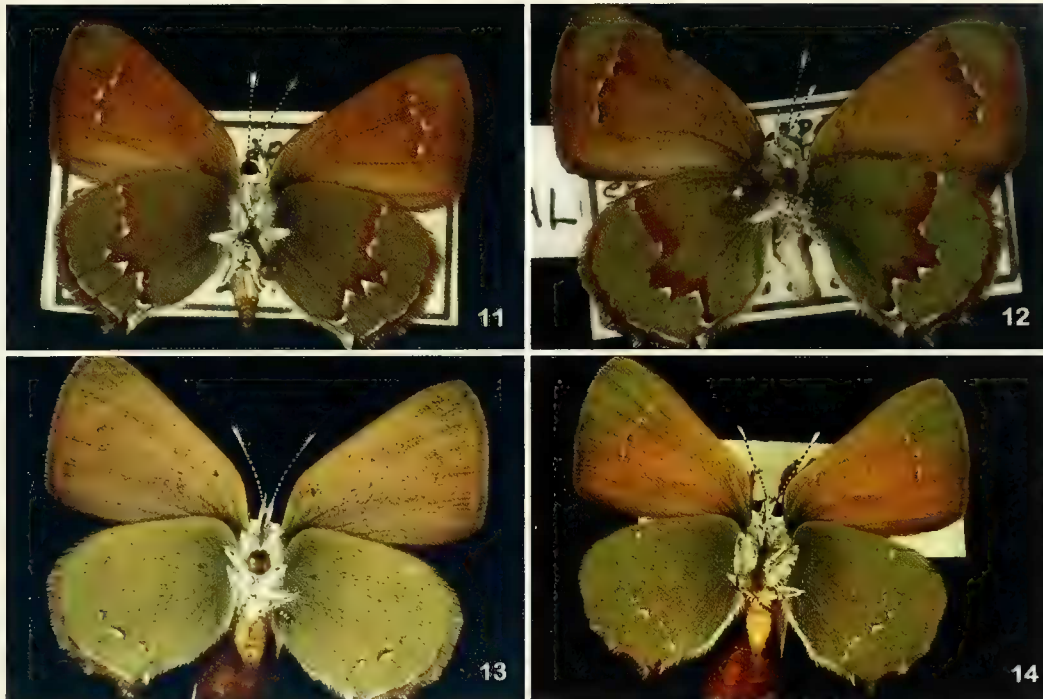
**Range and habits.** *C. a. albipalpus* is endemic to the Sacramento Mountains of south central New Mexico. It prefers the sun-exposed canyons and disturbed areas that exist in the vicinity of New Mexico State highways 37 and 48 at or above 2100m. First generation males and females often obtain nectar from the flowers of *Melilotus indicus* (L.), while second generation individuals prefer those of *Eriogonum jamesii*. Bivoltine in most years, it appears to be strongly influenced by ecological succession and thus relocates for both nectaring and oviposition. *E. alatum* appears to be the preferred larval hostplant (Table 2). Male hilltopping has not been observed.

***Callophrys affinis chapmani* ssp. nov.**

(Figs. 11, 12)

**Description: Head:** Antennae black with 17 white annuli basal segment bicolored (black mesially, white laterally); club annuli black, terminally orange brown; labial palp scaling black, white laterally; distal segment black with white tip. **Dorsal surface of forewing:** FWL = 13.2 mm. Ground color uniform gray brown with concolorous venation; stigma gray; outer margin scales dark brown; fringe brown basally, pale distally. **Dorsal surface of hindwing:** Ground color and outer margin as in forewing; fringe tricolored (brown basally, pale mesially, orange brown distally); fringe at tips of veins Cu2, 2A, and 3A with elongated white scales. **Ventral surface of forewing:** Ground color grayish brown from posterior margin to vein Cu2; brown to costa; incomplete band of five submesial white maculations between vein R4 and Cu1, displaced laterally between vein M3 and Cu1; white maculations very weakly black-scaled mesially; basal, apical and subapical regions lateral to submesial maculations with olive green scaling; outer margin brown with tricolored fringe (basally light brown, mesially gray brown, distally pale along anterior margin, with distal portion becoming brown near tornus). **Ventral surface of hindwing:** Ground color olive green, with complete submesial band of white maculations displaced laterally between veins Cu1 and 2A; basal brown scaling of maculations form a contiguous band 0.8 to 1.0 mm wide; prominent black scaling mesially; outer margin brown with white scaling that forms a line between veins 3A and Cu1; fringe





FIGS. 11–14: **New subspecies of *Callophrys affinis*** **11:** *C. affinis chapmani*, holotype male, 38 km east of El Salto, Hwy. 28, 2439 m, collected ex ovum on July 13, 1985 -emerged: August 28, 1985, G.A. Gorelick, collector **12:** *C. affinis chapmani*, allotype female, 38 km east of El Salto, Hwy. 28, 2439 m, Durango, Mexico, collected ex ovum on July 13, 1985 -emerged: August 27, 1985, G.A. Gorelick, collector **13:** *C. affinis albipalpus*, allotype female, 10 km north of Ruidoso, 2134 m, Lincoln Co., NM, collected ex female on June 28, 1982 - Emerged: August 15, 1982, G.A. Gorelick, collector **14:** *C. affinis albipalpus*, holotype male, 10 km north of Ruidoso, 2134 m, Lincoln Co., NM, collected ex female on June 28, 1982 - Emerged: August 15, 1982, G.A. Gorelick, collector

tricolored (basally brown, mesially gray brown, distally mixed pale and gray brown); fringe between veins 2A and 3A distally dark brown; elongated white fringe scaling at tips of veins Cu2, 2A and 3A.

**Allotype female: Head:** Antennae with 17 white annuli, the distal three contiguous ventrally; basal and distal segments as in holotype male; labial palps white-scaled laterally; distal segment brown, white-tipped. **Dorsal surface of forewing:** FWL= 13.8 mm. Ground color uniform orange brown with 1.0 mm wide dark brown outer margin; fringe as in holotype male. **Dorsal surface of hindwing:** Ground color as in forewing, with 0.8 mm wide outer margin; fringe as in holotype male; fringe between veins Cu2 and 3A light brown distally; fringe at tips of veins 2A and 3A with elongated white scales. **Ventral surface of forewing:** Ground color as in holotype male; incomplete band of four nondisplaced white submesial maculations between vein R5 and Cu1 with prominent black scaling mesially; basal, apical and subapical area lateral to submesial maculations dark green; outer margin and fringe as in holotype male. **Ventral surface of hindwing:** Ground color dark green; submesial band of white maculations as in holotype male; contiguous brown scaling 1.5 to 1.8 mm wide; outer margin, tips of veins, and fringe as in holotype.

**Types.** The holotype male and allotype female were both collected and reared *ex ova* by the author, 38 km east of El Salto, 2439m in the Sierra Madre Occidental range of Durango, Mexico on July 13, 1985. The adults emerged on August 28, 1985. These will be deposited in the Natural History Museum of Los Angeles County along with four paratypes (2♂, 2♀) from the same locality. The remaining 14 paratypes (both reared and field collected) were taken between the city of Durango and the village of El Salto on Mexico Hwy. 28 (1964–1986). Two of these paratypes will be distributed to each of the same institutions listed for *C. affinis albipalpus*.

**Etymology.** This patronym honors Dr. Thomas Algernon Chapman (1842–1921), Scottish physician and

lepidopterist. Dr. Chapman named and described the related species, *Callophrys avis* from sage scrub plant communities in SE France, the Iberian Peninsula and North Africa (Chapman, T.A., 1909). Additionally, he published a life history complete with a description of each larval stage, along with photographs and comparisons to closely related *C. rubi* in detail atypical for his time (Chapman, T.A., 1910).

**Diagnosis.** Unlike the closest ally, *C. a. apama*, the ventral hindwings of both sexes of *C. a. chapmani* exhibit a distinct mesial row of dark brown scales between veins M3 and 2A near the tips. The mesial brown scaling along the maculations forms a single continuous band one mm. in width. The green scaling of the ventral hindwing is typically olive green in males and dark green in females. The labial palp scaling is tricolored (black and brown, with white tips).

**Range and habits.** *C. a. chapmani* is multivoltine and only occurs in the Sierra Madre Occidental range above 2200m in the states of Sonora and Durango in Mexico. It frequents disturbed areas that include sun-exposed fields and arroyos along roadsides. Both sexes prefer to perch on and obtain nectar from their larval hostplants, *Ceanothus huichagorare* and *Eriogonum atrorubens*.

## ECOLOGY

Adult *C. affinis* are univoltine in the northern part of their range, appearing between late March and June in Colorado and Wyoming and into July for higher elevation populations (Ferris and Brown, 1981). Bionomics of *C. affinis* from the Pacific Northwest are presented by Christensen (1981). Colorado prairie populations are double-brooded in some years, emerging in May with a second brood appearing in late July and/or August (A.D. Warren, pers. comm.). In western Nebraska, flight occurs only in June and early July. In northern Arizona, relatively large populations were observed above 2287m elevation between late May and early July. These may be bivoltine since adults are also on the wing in August and Septembers. Unlike most populations of *C. affinis* where bivoltinism is unproven, the Sacramento Mountains adults were collected between early June and late August, suggesting bivoltinism in most years. In the Sierra Madre Occidental of Durango, Mexico, specimens obtained between April and September reveal a multivoltine existence.

Unlike related California *Callophrys* that exhibit a preference for open areas (Ferris 1971b) and hilltopping/territorial behavior (Gorelick, 1971), *C. affinis apama* adults preferred to visit flowering vegetation along open roads and canyon bottoms and stayed relatively close to stands of their larval hostplant. This tendency was also mentioned by Ferris (1971b) pertaining to Wyoming populations. Behavioral similarities to *C. affinis affinis* such as hilltopping have been reported in several Colorado and New Mexico localities (Stanford 1977, S.J. Cary pers. com.). No hilltopping behavior was observed in the *C. a. affinis/homoperplexa* blends of Albany and Laramie counties in Wyoming or in the populations studied in Banner and Cheyenne counties in Nebraska. Male *C. affinis* specimens from several localities in the vicinity of Aspen, Colorado (Pitkin County), exhibited variation in VHW maculations. These males exhibited hilltopping behavior (R.E. Stanford pers. com.). The sparse, non-contiguous VHW maculation pattern of these Pitkin County specimens is reminiscent of such patterns observed in many *homoperplexa* specimens from other Colorado localities. These maculation patterns indicate the existence of a probable blend zone between *C. a. affinis* and *C. a. homoperplexa* in this area. In that no significant ecological or behavioral isolation is evident, these taxa are undoubtedly conspecific as per the discussion by Kohn & Orians (1962).

Adults of *C. a. apama* encountered in montane localities west of the Continental Divide in Arizona,

New Mexico, and Utah frequently visited the flowering shrub, *Ceanothus fendleri* A. Gray (Rhamnaceae). This plant typically blooms between May and July and is used both as a larval hostplant and as a nectar source. Utah populations also used *C. fendleri* along with *Eriogonum racemosum* Nuttall (Polygonaceae), even when these occur together in the same locality. In addition, *C. affinis affinis* in UT uses many species of *Eriogonum*: *E. alatum*, *E. heracleoides* Nuttall., *E. umbellatum* Torrey, and *E. racemosum* (Jack L. Harry pers. com.) (Table 2)

Mexican populations typically occur in association with *Eriogonum atrorubens* Engelmann and *Ceanothus huichagorare* Loesner, a species closely allied to *C. fendleri*. On these plants, nectaring was observed in the morning and late in the day, with oviposition usually occurring during the early afternoon hours on both plants

In most localities in the Front Range of the Rocky Mountains and east of the Continental Divide in the U.S., *Ceanothus fendleri* was the preferred hostplant whenever present. In its absence, species of *Eriogonum* were adopted: *E. flavum* Nuttall (Wyoming), *E. umbellatum* (Colorado), and *E. alatum* (New Mexico).

While *C. affinis apama* appear to be on the wing virtually everywhere one finds abundant *Ceanothus fendleri* above 2287m, this association in regards to potential *Eriogonum* hosts was not observed. In Mexico, *Eriogonum atrorubens* occurs in oak-juniper grasslands of Chihuahua and Zacatecas, and in the Sierra Madre Oriental of southern Coahuila (Reveal 1967), areas providing no records or evidence of any *Callophrys*. In this regard, Gilbert and Singer (1975) pointed out that many butterfly species are much more restricted in their distributions than are their potential hostplants.

Males employed shrubs such as *Cercocarpus* species (New Mexico, Colorado, Wyoming), *Rhus aromatica* Ait. (Nebraska, Colorado, New Mexico), *Quercus gambellii* Martin and Drew, and *Q. undulata* Torrey (Colorado, New Mexico) as perching sites used to initiate courtship flights. Such behavior was observed between 9 AM and 4 PM. They may also perch on tall grass, as reported by Scott (1975).

Courtship and mating displays were frequently observed in sun-exposed terrain either on low vegetation, larval hostplants, or on male perching sites between 9 AM and 12 PM. *C. affinis apama* oviposition behavior was similar to that seen in other *Callophrys* (Gorelick, 1971). Females preferred to remain in close association with the larval hostplant throughout their flight period, employing it also as a nectar source between 9 AM and 12 PM. After some abdominal probing, females placed a single egg on each floral tip

TABLE 2: Host plant associations for *Callophyrs affinis* subspecies

| Locality*   | <i>Ceanothus fendleri</i>         | <i>Eriogonum alatum</i>           | <i>Eriogonum racemosum</i> | <i>Eriogonum umbellatum</i> | <i>Eriogonum heracleoides</i> | <i>Eriogonum flavum</i>             | <i>Eriogonum atrorubens</i> | <i>Ceanothus huichagorare</i> |
|---|-----------------------------------|-----------------------------------|----------------------------|-----------------------------|-------------------------------|-------------------------------------|-----------------------------|-------------------------------|
| <b>Arizona</b>                                      |                                   |                                   |                            |                             |                               |                                     |                             |                               |
| 1. Strayhorse Cmpgd., White Mountains, Greenlee Co. | <i>C. affinis apama</i>           |                                   |                            |                             |                               |                                     |                             |                               |
| 2. Schultz Pass, Coconino Co.                       | <i>C. affinis apama</i>           |                                   |                            |                             |                               |                                     |                             |                               |
| <b>New Mexico</b>                                   |                                   |                                   |                            |                             |                               |                                     |                             |                               |
| 3. Zuni Mountains, Valencia Co.                     | <i>C. affinis apama</i>           |                                   |                            |                             |                               |                                     |                             |                               |
| 4. Jemez Mountains, Los Alamos Co.                  | <i>C. a. apama x homoperplexa</i> |                                   |                            |                             |                               |                                     |                             |                               |
| 5. Bandelier National Monument, Sandoval Co.        |                                   | <i>C. a. apama x homoperplexa</i> |                            |                             |                               |                                     |                             |                               |
| 6. Sacramento Mountains, Lincoln Co.                |                                   | <i>C. a. albipalpus</i>           |                            |                             |                               |                                     |                             |                               |
| <b>Utah</b>   |                                   |                                   |                            |                             |                               |                                     |                             |                               |
| 7. Singletree Cmpgd. Wayne Co.                      |                                   | <i>C. affinis apama</i>           |                            | <i>C. affinis apama</i>     |                               |                                     |                             |                               |
| 8. 7.4 mi. south of Torrey, Wayne Co.               | <i>C. affinis apama</i>           |                                   | <i>C. affinis apama</i>    |                             |                               |                                     |                             |                               |
| 9. 3.2 mi. north of Long Valley jct., Kane Co.      |                                   |                                   | <i>C. affinis apama</i>    |                             |                               |                                     |                             |                               |
| 10. Hwy 24, Piute Co.                               |                                   |                                   | <i>C. a. affinis</i>       |                             |                               |                                     |                             |                               |
| 11. 28 mi. SE Moab                                  |                                   | <i>C. affinis apama</i>           |                            |                             |                               |                                     |                             |                               |
| 12. Rich Co.  |                                   |                                   |                            | <i>C. a. affinis</i>        |                               |                                     |                             |                               |
| 13. 4 mi. NE of Accord Lakes, Sevier Co.            |                                   | <i>C. a. affinis</i>              |                            |                             |                               |                                     |                             |                               |
| 14. Wilkerson Pass, Park Co.                        |                                   | <i>C. a. affinis</i>              |                            |                             |                               |                                     |                             |                               |
| 15. 2.6 mi. SW of Lynn, Box Elder Co.               |                                   |                                   |                            |                             | <i>C. a. affinis</i>          |                                     |                             |                               |
| <b>WYOMING</b>                                      |                                   |                                   |                            |                             |                               |                                     |                             |                               |
| 16. Woodruff, Lincoln Co.                           |                                   |                                   |                            | <i>C. a. affinis</i>        |                               |                                     |                             |                               |
| 17. nr. Evanston, Uintah Co.                        |                                   |                                   |                            | <i>C. a. affinis</i>        |                               |                                     |                             |                               |
| 18. east of Laramie, Albany Co.                     |                                   |                                   |                            |                             |                               | <i>C. a. affinis x homoperplexa</i> |                             |                               |

TABLE 2: continued

| Locality <sup>a</sup>                                | <i>Ceanothus fendleri</i> | <i>Eriogonum alatum</i> | <i>Eriogonum racemosum</i> | <i>Eriogonum umbellatum</i> | <i>Eriogonum heracleoides</i> | <i>Eriogonum flavum</i>            | <i>Eriogonum atrorubens</i> | <i>Ceanothus huichagorare</i> |
|--|---------------------------|-------------------------|----------------------------|-----------------------------|-------------------------------|------------------------------------|-----------------------------|-------------------------------|
| <b>Nebraska</b>                                      |                           |                         |                            |                             |                               |                                    |                             |                               |
| 19. Sidney rest area Interstate Hwy 80, Cheyenne Co. |                           |                         |                            |                             |                               | <i>C. a affinis x homoperplexa</i> |                             |                               |
| 20. Bull Canyon, Banner Co.                          |                           |                         |                            |                             |                               | <i>C. a affinis x homoperplexa</i> |                             |                               |
| <b>Mexico</b>  |                           |                         |                            |                             |                               |                                    |                             |                               |
| 21. Sierra Madre Occidental, Durango                 |                           |                         |                            |                             |                               |                                    | <i>C. a. chapmani</i>       | <i>C. a. chapmani</i>         |

<sup>a</sup>Locality details:

1. Strayhorse Cmpgd., Hwy 666, 8000', White Mountains, Greenlee Co. [GAG]
2. 5 mi. N. of Flagstaff Schultz Pass, 7800', Coconino Co. [GAG]
3. Zuni Mountains, 8000', Valencia Co. [GAG]
4. Jemez Mountains, nr. Los Alamos, Burnt Mesa, Hwy 4, 7000', Los Alamos Co. [GAG]
5. Bandelier National Monument, 7000' Sandoval Co. [SJC]
6. Sacramento Mountains, 5 mi. north of Ruidoso, 7000', Lincoln Co.
7. Singletree Cmpgd., Hwy 12 11 mi. south of Torrey, 8300', Wayne Co. [JLH]
8. 7.4 mi. south of Torrey, North Slope Rd, 8000', Wayne Co. [JLH]
9. 3.2 mi. north of Long Valley jct., Hwy 89, 7200' Kane Co. [JLH]
10. Hwy 24, 1 mi. south of jct., UT Hwy 24/25, 8300', Piute Co. [JLH]
11. 4.5 mi. SSW Buckeye Reservoir, 7700', 28 mi. SE Moab [JLH]
12. 1.4 mi. north of SW corner of Lincoln Co., WY, 6600', Rich Co. [JLH]
13. 4 mi. NE of Accord Lakes, 8400', Sevier Co. [JLH]
14. 2 mi. E. of Wilkerson Pass, 9100', U.S. Hwy 24, Park Co. [JLH]
15. 2.6 mi. SW of Lynn, 6900', Box Elder Co. [JLH]
16. 8.2 mi. NE of Woodruff, 6800', Lincoln Co. [JLH]
17. 10 mi. N. of Evanston, 6700', Uintah Co. [JLH]
18. east of Laramie, 4450' Albany Co. (young stages unobserved; adults occur in association with *Eriogonum flavum*)
19. Sidney rest area Interstate Hwy 80, 4200', Cheyenne Co. (young stages unobserved; adults occur in association with *Eriogonum flavum*)
20. Bull Canyon, 17 mi. SW of Harrisburg, 4500' Banner Co. (young stages unobserved; adults occur in association with *Eriogonum flavum*)
21. Sierra Madre Occidental, 13 mi. E. of El Salto, 8000', state of Durango [GAG]

between 10 AM and 12 PM.

First generation females oviposited at the tip of the shoot, preferring the floral calyx (Figs. 15–16). First instars fed on new leaves at the tip, or on unopened sepals and petals when available. Later instars moved to the relatively immature leaves a few centimeters from the tip of the stem where they fed after consuming the flower bud. Mature larvae consumed the young leaves. Females in later broods oviposited on sepals or terminal leaves and emerging larvae fed on the flowers, moving from flower to flower on the stem. Mature larvae generally assumed the color of these flowers (Figs. 17–21).

While eclosions were noted in most field-collected eggs during the study, each of eight eggs collected on the flowers of *C. fendleri* growing below San Francisco Peaks (8 km north of Flagstaff, Arizona) was sucked dry by a hemipteran (J. Emmel pers. com.). Field-collected larvae below San Francisco Peaks, and Rose Peak along U.S. Hwy 191 in eastern Arizona were subjected to

occasional parasitism by *Apanteles* sp., a braconid wasp. Along a 1-kilometer length of road at both localities, it was not uncommon to find up to 60 first and second instar larvae in a single day. These larvae exhibited mortality from disease and parasitism of up to 45%. In captivity, mature larvae crawled from the leaves and flowers onto the substrate and attached themselves to the surface or underside of the dead leaves where they pupated.

In canyons along New Mexico state highways 37 and 48 amongst stands of *Pinus ponderosa* Douglas ex Lawson, *Quercus undulata*, *Artemisia dracunculoides* Pursh., and *Eriogonum jamesii* Benth., where *Ceanothus fendleri* was not found, attempts to collect eggs and larvae of *C. affinis* on *Eriogonum jamesii* were unsuccessful despite its use by both females and males as a nectar source.

In the Sierra Madre Occidental, west of Durango above 2439m, oviposition and mating behavior was found to be the same as observed in *C. a. apama*. A



FIGS. 15-21: Immature stages of *Callophrys affinis*. 15-16. Egg of *C. affinis chapmani* on sepal of *Eriogonum atrorubens* flower, Durango, Mexico. 17. Mature larva of *C. affinis apama* on *Ceanothus fendleri*, Greenlee Co., AZ. 18. Mature larva of *C. affinis affinis* on *Eriogonum umbellatum*, Lincoln Co., WY. 19. Mature larva of *C. affinis albipalpus* on lab host, *Eriogonum grande rubescens*, Lincoln Co., NM. 20. Mature larva of *C. affinis chapmani* on *Eriogonum atrorubens*, Durango, Mexico. 21. Mature larva of *C. affinis chapmani* on *Eriogonum atrorubens*, Durango, Mexico

search of a grassy meadow adjacent to farmlands along the highway 21 km east of El Salto (vicinity of Llano Grande) yielded 143 *Callophrys* eggs (116 living, 11 dead, 16 eclosed) collected in four days (July) on abundant stands of *Eriogonum atrorubens*. In addition, 77 first instar larvae were collected, with up to 6 larvae

on the same plant. Parasitism, infertility, and larval mortality reduced this number to eight specimens successfully reared to adulthood. Approximately 25 first instar larvae were preserved for later study. Along the roadside 45 km east of El Salto, an area characterized by *Pinus engelmanni* Carr., *P. durangensis* Martinez,

*Arbutus* sp., *Quercus* sp., and *Arctostaphylos* sp. between 2439–2500m, a total of four variable instar, green-colored larvae were taken on the same day from *Ceanothus huichagorare*. No red-colored larvae were found on the abundant *E. atrorubens* growing nearby yet two variably red and green larval morphs were collected on *E. atrorubens* bloom stalks growing along the roadside 38 km east of El Salto.

Field-collected adults were rare. No more than three adults of either population were typically seen on any given July day during the study. Interestingly enough, all modern records of *C. affinis* from the Sacramento Mountains are from areas burned by wildfires in the 1970s.

The known larval hosts for *C. affinis* in New Mexico (*C. fendleri*, *E. alatum*) are early successional plants. Outside of occasional wildfires and other disturbances, a decline of hostplants thus appears to be due to ecological succession (Pratt 2001). This suggests that the occurrence of *C. affinis* is determined primarily by the ecological structure of its habitat or its successional stage rather than the larval host, and it may therefore use any suitable hostplant(s) that are present at a given site. In addition, erosion brought on by excessive summer rainfall and the potential loss of *Eriogonum atrorubens* due to grazing and local human consumption add to selective pressures operating on the population of *C. affinis* along Hwy 28 in the Sierra Madre Occidental of the state of Durango in Mexico.

#### CONCLUSIONS

Macular band variation, phenotypic intergrades, synchrony and similar hostplant choices and behaviors warrant the inclusion of *C. apama* as a subspecies of *C. affinis*. Additionally, both behavioral and geographic isolating factors appear to have arisen in the southernmost distribution of *C. affinis*. This scenario conforms well to that described by Cox *et al* (1977), Holland (1988) and Shields (1996) in regards to geographic isolation in southwestern North American butterflies.

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General de la Fauna Silvestre, Mexico City, (under the auspices of the Museum of Natural History of Los Angeles County) for collecting the specimens used in the type series described herein. Young stages of *C. a. chapmani* and *C. a. albipalpus* were reared in my absence by Greg Ballmer and John Emmel, respectively. John Emmel, Don Frack, and Jack Harry provided photos of the young stages. At Citrus College, Barbara Rugeley and Tina Gutierrez provided library resources. I also received technical assistance in photographing the adults from Darrell Carr, and graphic illustration in Figure 1 by Christopher Guerra and Dr. Richard Fernandes. I examined adult specimens in private collections, California Academy of Sciences, Museum of Natural History-Los Angeles County, California Academy of Sciences (San Francisco), Essig Museum of Entomology (University of California, Berkeley), Entomology Research Museum (University of California, Riverside), Bean Museum (Brigham Young University), University of Colorado (CU Museum- Entomology section), C.P. Gillette Museum of Entomology (Colorado State University), American Museum of Natural History (New York) and the Carnegie Museum (Pittsburgh). Plant records were accessed from Rancho Santa Ana Botanic Gardens, Museum of Natural History-Los Angeles County, University of California, Riverside, University of New Mexico, New Mexico State University and the University of Wyoming. This paper was reviewed by Steve Cary, Paul Opler and Gordon Pratt. Grateful thanks go especially to Andrew D. Warren, whose comments, suggestions, and contributions of distribution records from the Pacific Northwest greatly enhanced this study. To Richard Holland, I offer my sincere thanks for the years (and miles) of assistance and patience necessary to successfully complete this review.

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#### APPENDIX: MATERIAL STUDIED

##### *Callophrys affinis affinis* (W.H. Edwards)

- no locality, W.H. Edwards collection, designated **lectotype**, F.M. Brown (1967), 1♂
- no locality, W.H. Edwards collection, designated **lectotype**, F.M. Brown (1967), 1♀
- no locality, W.H. Edwards collection, designated **paratype**, F.M. Brown. (1967), 1♂

##### NEVADA:

**Elko Co:** Spruce Mtn., Pequop summit, Steptoe Valley, T31N R64E Sec. 33, VI-8 (no year or collector given)

**Lander Co:** Kingston Canyon, VI-18-1970, 1♂, C.D. Ferris, coll., Austin summit, VI-13-2002, 2m, P.A. Opler, coll.

**Lincoln Co:** Highland Peak, Highland Range, VI-17-1990, 1♂, 1♀, G.T. Austin, coll.

**Nye Co:** Antone Creek, Toquima Mtns.; VI-13 & VI-15-1933, 2♀, F.W. Morand, coll.; Jett Cyn., V-25/26-1974, 1♂, 1♀, J. DeBenedictis & W.E. Knoshaug, colls.

**White Pine Co:** Mt. Wheeler, VI-2 to 6-1929, 2m, F.W. Morand, coll.; Wilson Creek Range, base of Mt. Wheeler, 8700', VI-7 to 8-1985, 1♂, 1♀, G.A. Gorelick & G.T. Austin, colls., Indian Creek, Schell Creek Range, V-10-1984, 1♂, G.T. Austin, coll.; Snake Creek, 8000', Snake Range, VI-27-1972, 1♂, 1♀, Scott L. Ellis, coll.

##### UTAH:

**Box Elder Co:** 2.6 mi. SW Lynn, 6900', coll. ex larvae on *Eriogonum heracleoides* (emerged IV-21-1988), 2♂, J.L. Harry, coll.

**Garfield Co:** Panguitch-Cedar Break Rd., Markagunt Plateau, VI-20-1972, 2♂, 1♀, Scott L. Ellis, coll.

**Juab Co:** Eureka, 7500' elev., no date, 4♂, R.C. Williams collection; VI-18-1910, 1♂, 1♀, T. Spalding, coll.

**Park Co:** 2 mi. E. of Wilkerson Pass, 9100', U.S. Hwy 24, coll. ex larvae on *Eriogonum alatum*, VII-7-1988 (emerged: VIII-18-1988), 1♂, 1♀, J.L. Harry, coll.

**Piute Co:** UT Hwy 24, 1 mi. So. of jct., UT Hwy 24/25, 8300', coll. ex larvae on *Eriogonum racemosum* (emerged X-19-1986), 1♂, J.L. Harry, coll.; 0.7 mi up Hwy 25, Fish Lake Road, VI-21-1971, 1♀, J.A. Scott, coll.

**Rich Co:** 1.4 mi. north of SW corner of Lincoln Co., WY (0.1 mi. W. state line), 6600', coll. ex larva on *E. umbellatum*, VI-1983 (emerged VIII-9-1984), 1♂; coll. ex larvae on *Eriogonum umbellatum*, VI-1985 (emerged II-1986), 4♂, J.L. Harry, coll.; 4.5 mi. NE Woodruff, east side of Crawford Mtns., 6800', 4♀, coll. ex larvae on *E. umbellatum* (emerged II-13-1986), J.L. Harry, coll.

**Sanpete Co:** 18 mi. w. of Levan, VI-22-1979, 1♂, W.H. Whaley, coll.

**Sevier Co:** Fish Lake, VI-24-1927, 1♂, 1♀, Ashby Boyle collection; Old Woman Plateau, VII-2-1986, 1♂, C.A. Miles, coll.; 0.1 mi. N. Hogan Pass, 8500', V-5-1987, 2♂, J.L. Harry, coll.; 4 mi. NE Accord Lakes, Duncan Draw, 8400', coll. ex larvae on *Eriogonum alatum* (emerged V-1988), 2♂, 4♀, J.L. Harry, coll.

**Summit Co:** Snyderville, VII-27-1980, 1♀, Ken Tidwell, coll.; North fork, Provo River, Uintah Mtns., 7500', VI-29-1965, 1♂, 2♀, John Justice, coll.; 8000', VII-5-1964, 2♀, Ken Tidwell, coll.; VI-15-1963, 1♂; VII-5-1964, 1♀, J. Don Eff, coll.

**Uintah Co:** Blue Mountain Plateau, Dinosaur National Monument, VI-1968, 2♂, Scott L. Ellis, coll.

**Utah Co:** Provo Peak, VII-30-1982, 1♂, C.A. Miles, coll.; Silver Lake, VII-15-1899?, 3♂, 2♀, Henry Skinner, coll.; VII-17-1949, 1♂, 6♀, A.J. Snyder, coll.

**County unknown\*:** City Creek Canyon, VII-12 to 15-1899, 2♂, Henry Skinner, coll.

\*cited as the type locality erroneously by Clench (1944); corrected type locality (Fort Bridger, WY) published by E.M. Brown (1970).

#### WYOMING:

**Carbon Co:** Bottle Creek Campground, southwest of encampment, 8400', VI-25-1972, 1♀; VI-17-1981, 1♂, 1♀; VI-21-1982, 1♀; VII-2-1982, 1♂, C.D. Ferris, coll.

**Fremont Co:** Sinks Canyon Rd. at Slate Creek, VII-1-1979, 1♂, J. Brock, coll.

**Natrona Co:** Casper Mountain, V-30-1988, 1♂, Karolis Bagdonas, coll.

**Teton Co:** Teton Mtns., VII-8 to VII-17-1937, 4♂, 3♀, R.W. Wind, coll. [Nevada State Museum]; Jenny Lake, Teton Mtns., VI-14-1931, 1♀, no coll.; 7♂, 14♀, no date, Wallace-Bauer coll'n; VI-15 to 17-1956, 4♂, 2♀, J. Don Eff, coll.; VII-12-1937, 1♂, 1♀, R.G. Wind, coll.; Teton National Park along Snake River, VI-1/15-1979, 3♂, 2♀, T. McGann and U. of Wyoming (Zoology Dept.)

**Albany Co:** Pole Mountain, 8500', VII-21-1977, 1♀, C.D. Ferris, coll.; VII-1-1996, 1♂, G.A. Gorelick, coll.

**Lincoln Co:** Cokeville, VI-16-1979, 1♂, W.H. Whaley, coll.; 8.2 mi. NE Woodruff, Wildhorse Spring, 6800', coll. ex larvae on *E. umbellatum* (emerged III-12-1986), 5♂, J.L. Harry, coll.; 4.5 mi. E. of Rex Peak, 0.4 mi. SE rd jct., 6900', coll. ex larvae on *E. racemosum*, VI-1985, (emg'd III-24-1985), 1♀, J.L. Harry, coll.; coll. ex larvae on *E. racemosum*, VI-1986, (emerged III-11-1986), 3♂, 4♀, J. L. Harry, coll.

**Uintah Co:** Evanston, VI-4-1885, 1♂, ex Skinner coll'n; 10 mi. No. of Evanston, 0.5 mi. E. of county road, 6700', coll. ex larvae on *E. umbellatum* (emerged III-12-1986), 3♂, J.L. Harry, coll.

**Sublette Co:** Trail's End Campground., Elkhart Park, 9350', VII-22-1991, 2♀, Larry D. Beutler, coll.

**Sweetwater Co:** Pine Buttes, VII-1942, 1♂, 1♀, L. Bauer, coll.; 25 mi. south of Bitter Creek, VII-1942, 1♂, L. Bauer, coll.

#### IDAHO:

**Franklin Co:** Birch Creek, 5700', VI-6-1990, 1♀, C.D. Ferris, coll.

**Oneida Co:** 3rd Creek Trailhead, 3 mi. east of SR 36, 6400', VI-23-2002, 2♂, R.E. Stanford, coll.

#### MONTANA:

**Beaverhead Co:** Polaris, VI-2-1943, 1♀, H.A. Howland, coll.; Lemhi Pass, 7340-7400', VII-15-1978, 1♀, J.F.G. Clarke, coll.; VII-21-1995, 1♂, J. Verhulst, coll.

**Big Horn Co:** Bighorn Canyon, 4610', V-28-1995, 1♂, C. Harp, coll.

**Carbon Co:** East Rosebud Canyon, 1750m, VII-5-1966, 1♂, C. Durden, coll.; VI-7-1992, 1♂, B. Vogel, coll.; East Rosebud Lake, 1850m, VI-27-1966, 1♂, C. Durden, coll.

**Fergus Co:** Little Snowy Mountains, VII-13-1976, 1♀, S. Kohler, coll.

**Gallatin Co:** Hebgen Lake, VI-21-1962, 1♂, J.A. Scott, coll.

**Granite Co:** Black Pine Road, VI-26-1990, 1♂, S. Kohler, coll.

**Hill Co:** Beaver Creek, Bear Paw Mountains, VI-20/28-1982, 10♂, 2♀, N. G. Kondla, coll.

**Judith Basin Co:** 15 mi. SW of Utica, 4800', VI-28-1998, 1♂, R. Stanford, coll.

**Madison Co:** Camp Creek, east of Melrose, 5485', VI-7-2001, 1♂, S. Kohler, coll.; off Camp Creek Road, east of Melrose, VI-18-2001, 1♀, S. Kohler, coll.

**Missoula Co:** Ninemile Prairie, VI-9/18-1979, 9♂, 1♀, S. Kohler, coll.; Ninemile Prairie, up ridge to north near Hwy. 200, 3900', VI-8-2001, 1♂, S. Kohler, coll.; Shoofty Meadows, VII-4-2003, 1♂, D. Thompson, coll.

**Powell Co:** S. Helmsville, VI-5-1989, 2♂, S. Kohler, coll.

**Silver Bow Co:** Rocky ridge trailhead, 2.5 mi. W. of Feely Divide Creek, VI-19-2003, 1♂, S. Kohler, coll.

**Sweet Grass Co:** East side, Crazy Mountains, VI-27-1966, 2♂, J. Scott, coll.; VIII-17-1966, 1♀, J. Scott, coll.; near Big Timber Creek, 4400', VI-28-1966, 1♂, J.A. Scott, coll.; Swamp Creek Road, Crazy Mountains, VII-12-1978, 3♂, 2♀, S. Kohler, coll.

**Wheatland Co:** breaks west of U.S. Hwy. 191, 4950', 13 mi. south of Harlowton, VI-28-1998, 1♂, R. E. Stanford, coll.

#### COLORADO: \*

**Garfield Co:** near Rifle, 2♂, 2♀ (no date or collector given); Roan Plateau, 9200', VI-18-1996, 2♂, C.P. Slater, coll.

**Grand Co:** Beaver Creek, VI-8-1977, 1♂, J. Donald Eff, coll.; Cottonwood Pt., 9800-10,000', 4 mi. south of Hot Sulphur Sprs., VI-3-1992, 4♂; VI-30-1993, 5♂, 2♀; VII-1-1993, 2♂, 1♀, all A.D. Warren, coll.; County Road 50, 4 mi. east of jct., U.S. Hwy 40, 8 mi. west of Hot Sulphur Springs, VI-29-1991, 1♀; VII-14-1991, 3♂, A.D. Warren, coll.

**Pitkin Co:** nr. Aspen Airport, 8100', VI-16-1973, 1♂; VI-13-1979, 3♂, R.E. Stanford, coll.; Aspen, V-25-1992, 1♂, R.E. Stanford, coll.; 0-3 mi. west of Aspen, VI-12 to 15-1969, 3♂, 1♀; VI-13-15-1979, 4♂, R.E. Stanford, coll. [GM-CSU]

**Roott Co:** Steamboat Springs, 7200', VI-20-1973, 2♂, R.E. Stanford, coll. [GM-CSU]; Little Snake River, 8000', VI-20-1973, 2♂, R.E. Stanford, coll. [GM-CSU]

**Summit Co:** 1 mi. W. of Keystone, VI-30-1990, 1♀, A.D. Warren, coll.

\* Additionally, both male and female adult specimens identified as *C.a. affinis* are housed in the collection of A.D. Warren [ADW] and were taken from localities in Rio Blanco and Moffat counties.

*C. affinis washingtonia* Clench

#### CANADA:

##### BRITISH COLUMBIA:

Oyama Lake, IV-22-1983, 1♂; Vernon, V-5-1983, 4♂, 1♀; Goose Lake, V-7-1984, 2♂, all C.S. Guppy, coll.; Kalamalka Lake, Cosen Bay, nr. Vernon, V-22-1976, 6♂, J. Shepard, coll.; Stubb Creek, Hwy 3, 8mi. E. Grand Forks, V-5-1973, 1♂, J. Shepard, coll.; Douglas Lake Rd., 30 mi. E. Merritt, V-22-1976, 1♂, J. Shepard, coll.

##### WASHINGTON:

**Columbia Co:** Blue Mtns., 4800' elev., VI-17-1961, E.J. Newcomer, coll.; along Tucannon River, Blue Mountains, VI-8-1963, 1♀, R.E. Woodley, coll.; south of Gilbirth Spring, T9N R40E sec. 35NE Y4, 4550', BMTR.15, VII-3-1964, 1♂, J. & S. Shepard, coll.

**Douglas Co:** Pine Creek, 700m, V-18-2000, 3♂, J. & S. Shepard, coll.

**Kititas Co:** Manastash Ridge, view point, Hwy. I-82, 2800', V-1-1983, 5♂, 2♀, J. Hinchliff, coll.; Manastash Ridge, 2672', V-18-1984, 1♂, J. & S. Shepard, coll.

**Lincoln Co:** Hawk Creek, 2300', V-17-1985, 2♂, J. & S. Shepard, coll.; head of Hawk Creek, V-28-1984, 1♂, J. & S. Shepard, coll.; Hawk Creek Cmpgd., no. of Creston, V-19-1979, 2♂, 1♀, J. Shepard, coll.

**Okanogan Co:** Brewster, V-9-1939, 1♂, J.C. Hopfinger, coll. (*paratype*); V-14-1956, 1♀, J.C. Hopfinger, coll. [CMNH]; Barker Mtn., 3800', VI-3-2000, 1♂, J. & S. Shepard, coll.; Strawberry Mtn. Lookout, 4200', VI-21-1961, 1♂, Jon Shepard, coll.

**Stevens Co:** Pascal Cemetery, nr. Fort Spokane, V-28-1984, 2♂, J. & S. Shepard, coll.

**Whitman Co:** Steptoe Butte, VI-15-1964, 1♂, 1♀, Jon Shepard, coll.

#### OREGON:

**Baker Co:** FR 11 to Bald Mtn., VI-19-01, 3♀, Vern Covlin, coll.; Cave Creek Rd., 4000', Burnt River, w. of Durkee, V-27-1973, 1♂ (very worn), J. Hopfinger,



coll.

**Crook Co:** Ochoco Mtns., Hwy. 126, ca. 1 mi. NE Nat. For. boundary, VI-10-2003, 2♂, A.D. Warren, coll.

**Gilliam Co:** Lonerock, 2000', VI-7-1961, 2♀, D.L. Bauer, coll.

**Grant Co:** Aldrich Mtn., Malheur Nat. For., VI-2-1992, 6991', 5♂, 1♀, J. Hinchliff, coll.; V-31-2001, 4♂, 1♀, A.W. Warren, coll..

**Harney Co:** Pueblo Mtns., 6500', Arizona Creek, VI-23-1979, 1♂ (worm), Mark Smith, coll.; summit of King Mtn., ca. 6400', VI-14-99, 9♂, 4♀, Vern Covlin, coll.

**Malheur Co:** Trout Creek Mtns., 7000', 10 mi. WNW McDermott, VI-8-1980, 1♂, 1♀, Mark Smith, coll.; 5-6 mi. N. of Beulah Reservoir, Bendire Mtn. Rd., 4700', V-17-2001, 27♂, 3♀, A.D. Warren, E. Runquist, D. McCorkle, collectors

**Malheur/Baker Co. line:** south of Rd. 16, 2-3 mi. SW Hwy. 26, VI-19-02, 4♂, 1♀, A.D. Warren, coll.

**Umatilla Co:** summit of Tower Mtn., ca. 6700', VII-5-99; VI-7-00; VI-14-01, 18♂, 8♀, Vern Covlin, coll.

**Wallowa Co:** ca. 10 mi. N. of Wallowa on rd. to Troy, VI-23-02, 1♀, A.D. Warren, coll.

#### IDAHO:

**Adams Co:** near mouth of Wildhorse River, V-12-1959, 1♀, S.G. Jewett, coll.

**Boise Co:** 5 mi. west of Idaho City, Cold Spring Creek, VI-8-1976, 1♀, J.F.G. Clarke, coll.

**Camas Co:** Willow Creek Cyn., V-27-00, 1♂, A.D. Warren, coll.

#### *Callophrys affinis affinis/homoperplexa* blend

#### WYOMING:

**Albany Co:** east of Laramie, T15N R73W S1, 4450', VII-17-1971, 2♂; VI-30-1972, 1♂; VII-1-1972, 1♀; VII-6-1972, 1♂; VII-8-1972, 1♀; VII-10-1972, 2♀; VII-18-1982, 1♀. VI-18 to VII-1-1996, 12♂, 4♀, C.D. Ferris, coll., VI-26/30-1996, 6♂, G.A. Gorelick, coll.

**Laramie Co:** 20 mi. W Cheyenne, Hwy 210, VI-22-1985, 1♂, P.A. Opler, coll.; 24 mi. W Cheyenne, Hwy 210, VI-15-1985, 1♂, P.A. Opler, coll.; Curt Gowdy St. Pk., 24 mi. W Cheyenne, Hwy 210, VII-6-1997, 5♂, G.A. Gorelick, coll.; 8 mi. S Cheyenne, VI-18-1985, 1♂, 2♀; VII-22-1985, 1♀, P.A. Opler, coll.

**Carbon Co:** near Battle Mountain, 7500', VI-20-1973, 1♂, R.E. Stanford, coll.

#### NEBRASKA:

**Morrill Co:** 6 mi. S Redington, VI-27-1974, 1♂, W.T. Morgan, coll.

**Cheyenne Co:** Hwy 180, Sidney rest stop, 4200', VI-29-1996, 20♂, 4♀; VII-10-1997, 1♂, 1♀, G.A. Gorelick, coll.; VI-1 to VI-29-1996, 8♂, Jim Reiser, coll.

**Banner Co:** Bull Canyon, 17 mi. SW Harrisburg, 4500', V-23-1994, 4♂, Jim Reiser, coll.; VI-30-1996, 4♂, 2♀, G.A. Gorelick, coll.

#### COLORADO:

**Jackson Co:** Sand Dunes (North Sand Hills SRMA), northeast of Walden, VI-18-1978, 1♂, Peter Eades, coll. (probable blend)

**Larimer Co:** County road 80C, 7.8 mi. E. Jct., county road 89, VII-6-1996, 1♂, A.D. Warren, coll. (very worn specimen - probable blend)

**Weld Co:** 7 mi. NW Carr, VI-13-1985, 1♂, P.A. Opler, coll.; 8 mi. NW Carr, VI-18-1985, 11♂, 4♀, P.A. Opler, coll.; 9 mi. NE Grover, 5455', VI-8-1991, 1♀, R.E. Stanford, coll.; Pawnee Buttes, Pawnee National Grasslands, 13 mi. south of Wyoming Border (north of Colorado state Hwy. 14), VI-21-1978, 1♂, Peter Eades, coll.

*Callophrys affinis apama* (W.H. Edwards)

"ARIZ", W.H. Edwards collection, designated *lectotype* by F.M. Brown, 1967, 1♂

"ARIZ", W.H. Edwards collection, designated *paratype* by H.R. Clench, 1973, 1♀

#### ARIZONA:

**Apache Co:** Greer, VI-12-1936, 1♂, G.H. & J.L. Sperry, coll.; Greer, White Mtns., VII-11-1995, 1♂, Ken Davenport, coll.; Wheatfields Creek, 8000', Chuska Mtns., VII-8-1978, 1♂, R.W. Holland, coll.; Lukachukai Creek Campground, 7000', Chuska Mtns., VI-14-1971, 1♂, R.W. Holland, coll.; McNary, VI-20-1981, 1♀, G.A. Gorelick, coll.; 1mi. E. McNary, VI-21-1981, 9♂, 3♀, G.A. Gorelick, coll.; 2 mi. S. McNary, VI-21-1981, 1♀, G.A. Gorelick, coll.

**Gila Co:** Tonto Creek Campground, nr. Kohls Ranch, VI-26-1956, 1♀, no coll.; "Gila Co.", VI-1902, 2♂, O.C. Poling, coll.; Sierra Ancha Mtns., VII-7-1933, 3♂, 3♀, Harold M. Bower, coll.; VII-4 & VII-10-1934, 2♂, D.K. Duncan, coll.; Globe, VI-4-1934, 1♀, no coll.; VII-11-1933, 2♂, no coll.

**Yavapai Co:** School House Gulch, Prescott, VII-9-1993, 4♂, Ken Davenport, coll.; Prescott, VII-7-1917, 1♂, J. Gunder coll'n; VII-9-1993, 3♂,

Ken Davenport, coll.; E. of Prescott, VII-11-1952, 1♀, Lloyd Martin, coll.; no locality, VII-1928, 1♂, O. Buchholz coll'n; Wolf Creek, S. of Prescott, VII-20-1959, 6♂, 3♀, R.F. Sternitzky, coll.

**Greenlee Co:** Strayhorse Campground, White Mountains, VII-28-30-1937, 25♂, 4♀; VII-1-3-1937, 29♂, 11♀, all Don Meadows, coll.; VII-7-1958, 1♀, J.W. Tilden, coll.; 8 mi. S. Strayhorse Campground, 8000', Hwy 666, VI-25-1981, 15♂, 3♀, G.A. Gorelick, coll.; Rose Peak, VII-7-1958, 2♂, 1♀, J.W. Tilden, coll.; 4 mi. S. Rose Peak, 7600', Hwy 666, VI-24-1981, 5♂, 2♀, G.A. Gorelick, coll.; White Mountains, VI-16-1947, 1♂, 1♀, E.P. Mellon II, coll., VI-28-1937, 1♀, M.E. Smith, coll., VI-26-1936, 1♀; VI-20 to 26-1936, 5♂, 1♀; VII-30-1937, 1♀, all L.P. Grey, coll.; VI-22-1936, 2♂; VI-28-1937, 1♂; VII-1-1937, 3♂, 1♀, all T.M. Dunkle, coll.; VII-26-1937, 4m, 1♀; VII-1-1937, 3♂, 1♀, T. Dunkle, coll.; VI-22-1942, 3♂, 4♀, H.A. Freeman, E.R. Hulbirt, coll.; VII-3& 4-1951, 3♂, 1♀; VI-16-1948, 1♂, E.R. Hulbirt, coll.; White Mountains, VI-8-1929, 1♂, L.I. Hewes, coll.; VII-18-1961, 2♂, Keith Brown, coll.; Hannagan Mdw., White Mtns., VI-20-1930, 3♂, J.C. Hopfinger, coll.; VI-20-1937, 2♂, 2♀, J. Baker, coll.; Blue Mtns., VI-30-1933, 1♂, E.R. Hulbirt, coll.

**Graham Co:** Mt. Graham, 1882, 2♂, Herbert K. Morrison, coll. (Skinner collection) (*paratype*); Graham Mtns., VII-4-1932, 1♂, R.G. Wind, coll.

**Coconino Co:** Lockett Lake Road, 7400', VI-5-1989, 1♂, Ken Davenport, coll.; Flagstaff, VII-27-1916, 2♂, J.A. Comstock coll'n; Schultz Pass, 7800', San Francisco Peaks, V-27-1960, 1♂, Lee D. Miller, coll.; 5 mi. NW Flagstaff, VI-4-1967, 1♀; V-19-1968, 5♂, 1♀; VI-11-1969, 1♂, R. Funk, coll.; Schultz Pass Rd., 4 mi. N. Flagstaff, V-29-1985, 5♂, 4♀, G.T. Austin, coll.; VII-21-1982, coll. ex larvae on *Ceanothus fendleri* (emerged IV-5-1983), 4♂, 2♀; VI-30-1986, coll. ex larvae (emerged III to V-1987), 5♂, 1♀, Dave Daniels, coll.; Alpine Garden Club tract, 5 mi. NW Flagstaff, VI-14-1970, 8♂, 3♀, R. Wielgus, coll.

**Cochise Co:** vic. Fort Grant, SW of Mt. Graham, 1♂, W.H. Edwards collection (*lectotype*), Huachuca Mtns., VI-23 to 30, no year, 12♂, Barnes coll'n; VI-6-1910, 4♂; VI-6-1916, 2♂, J.A. Comstock coll'n; VI-22-1910, 2♂, 2♀, E.I. Huntington coll'n; IX-8-1915, 1♀; V-24 to 30-1919, 1♂, W.G. Wright coll'n; V-16-1923, 1♂, V-24-1930, 1♂, R.C. Williams coll'n.; Carr Peak, Huachuca Mtns., VI-19-1940, 7♂; VI-23-P, 2♂, all A.C. Twomey, coll., Chiricahua Mtns., VI-20-30-1908, 6♂, 1♀, Victor L. Clemence, coll.; VI-30-1916, 1♂, V.W. Owen, coll.; VII-10-1958, 2♂, 1♀, J.P. & G.C. Hubbard, coll.

**Navajo Co:** Santa Rita Mtns., 5000-8000', July, 1♂, F.H. Snow, coll.; VI-20-1903, 1♀, Stephens, coll.; Pinal Mtns., VII-5 & 14-1900, 2♂; V-30-1925, 1♂, no coll.; Navajo Mtn., VI-14-1936, 1♂, no coll., VI-19-1935, 2♀, R.G. Wind, coll.; VII-12 & 13-1933, 4♂, 1♀, H.N. Hultgren, coll., VI-21-1935, 1♂, R.G. Wind, coll.; Williams Creek, North fork White River nr. McNary, V-29-1932, 1♂; VI-7-1932, 2♂, 1♀, no coll.; White Mtns.

**Pima Co:** Baboquivari Mtns., VII-15 to 30-1903, 2♂, 1♀, O.C. Poling, coll.; VIII-1 to 15, 1924, 15♂, 3♀, J. Gunder, coll.; Catalina Mtns., 7500', VI-13-1937, 4♂, 8♀, O. Buchholz coll'n.; 8500', VI-21-1936, 3♂, 1♀, C.F. dos Passos coll'n.; Mud Springs, Santa Catalina Mtns., 6500', VII-17 to 20-1916, 1♂, 2♀, no coll.; Catalina Mtns., 8500', VI-22 to 26-1936, 2♂, 2♀, L.P. Grey, coll.

#### UTAH:

**Garfield Co:** Blue Spruce Camp, 18 mi. north of Escalante, 8000', VII-5-1963, 1♂, F. Rindge, coll. [AMNH]

**Iron Co:** Burnt Peak Road, summit, 2412m, VI-21-1971, 1♂, 2♀, J.A. Scott, coll.

**San Juan Co:** Monticello, VI-25-1930, 1♀, Ashby D. Boyle coll'n; 4.5 mi. SSW Buckeye Reservoir, 7700', coll. ex larvae on *E. alatum* (emerged VI-9 to 12-1989), 9♂, 3♀, J.L. Harry, coll.; Navajo Mtn., 6000', VI-16 to 20-1936, 21♀, Allyn Museum collection.

**Kane Co:** U.S. Hwy 89, 3.2 mi. N. Long Valley Jct., 7200', coll. ex larvae on *E. racemosum* (emerged V-21-1987), 6♂, 2♀, J.L. Harry, coll.

**Wayne Co:** Singletree Campground, 8300', 11 mi. So. Torrey, collected ex larvae on *C. fendleri* and *E. racemosum* (emerged IV-25-1987), 5♂, J.L. Harry, coll.; 7.4 mi. so. Torrey, 8800', N. Slope Rd., coll. ex larvae on *C. fendleri* and *E. racemosum* (emerged IV-20-1987), 1♂, 1♀, J.L. Harry, coll.

**Grand Co:** 4.4 mi. no. Mt. Waas, 18 mi. E. Moab, 8500', VI-26-1987, 1♂, J.L. Harry, coll.

#### NEW MEXICO:

**Catron Co:** 2-3 mi. E. of Mogollon, 7200-7600', VII-11-1961, 1♀, AMNH collection.

**McKinley Co:** Grasshopper Canyon, 6800', 10 mi. S. Ft. Wingate, VI-26-1981, 4♂, 2♀, G.A. Gorelick, coll.; Grasshopper Spring, 7500', Zuni Mtns., V-7-1977, 2♀; V-23-1977, 3♂; V-16-1976, 3♂, all R.W. Holland, coll.; Tohatchi Peak, 8300', Chuska Mtns., VI-18-1978, 2♂, R.W. Holland, coll.; 1 mi. N. Tohatchi

Outlook, 8400', Chuska Mtns., IV-29-1972, 1♂; VI-4-1978, 1♂; VI-18-1978, 1♀; VI-18-1978, 1♀, all R.W. Holland, coll.; Ft. Wingate, V-25 to VII-1-1909, 12♂, 8♀, AMNH collection. Prop Cyn., 8000', Zuni Mtns., V-14 & V-29-1976, 3♂; V-30-1977, 2♂; VIII-15-1976, 1♂, R.W. Holland, coll.

**Valencia Co:** Pole Cyn., 8000-8500', Zuni Mtns., V-6-1977, 1♂; V-30-1977, 2♂; VI-12 to 24-1977, 3♂, 1♀; VII-29-1977, 1♂, all R.W. Holland, coll.; Ojo Redondo, Zuni Mtns., V-16-1970, 1♀, R.Bailowitz, coll.

**Grant Co:** McMillan Campground, 13 mi. N. Silver City, 6000-7000', VII-16 to VII-19-1964, 25♂, 18♀; Cherry Creek Campground, 6900', 13 mi. N. Silver City, VII-18-1964, 3♂, all F., P., & M. Rindge, colls.; Cherry Creek Cyn. & McMillan Cyn., 6700-7300', Pinos Altos Mtns., June-July 1976, 28♂, 29♀, C.D. Ferris, coll.; Pinos Altos Mtns., Pinos Altos, VII-4 to 10-1958, 3♂, 1♀, J.P. Hubbard, coll.; Pinos Altos Mtns., Cherry Creek, VII-6-1958, 3♂; VII-19-1959, 1♂, J.H., coll.; VII-10-1958, 1♂, J.P. & G.C. Hubbard, colls.; Cherry Creek, 7100' Gila Nat'l Forest, VII-1-1977, 1♂, C.D. Ferris, coll., vic. McMillan Cyn., 7400', Gila Nat'l Forest, VII-1-1977, 2♀, C.D. Ferris, coll.; Signal Peak Rd., Gila Nat. For., VI-29-1978, 1♂, C.D. Ferris, coll.; 12-14 mi. N. Silver City, 7000', VII-6-1985, 8♀, C.D. Ferris, coll.; VII-3-1986, 4♀, 7♂, G.A. Gorelick, coll.

**\*Otero Co:** Cloudercroft, VI-19-1902, 1♀, no coll.; High Rolls, V-22-?, 1♂, both in Carnegie Museum collection [CMNH] (\*Received from the Engel collection, these very early captures bore no collector labels and are probably mislabeled specimens)

#### NEW MEXICO:

**Chihuahua:** Mun. Casas Grandes, head of Rio Piedras Verdes, 7200', 30 15'N, 108 15'W, 1899, 1♀, Townsend, coll. [CMNH]; Madera, 7200', VII-6-1947, 2♀, W. Gertsch & M. Cazier, colls. [AMNH]; VIII-1968, 2♂, T. Escalante, coll., Arroyo Mesteno, Sierra del Nido, 7600', VII-21-1959, 1♀, W.C. Russell, coll.; 10 mi. E. Namiquipa, VII-3-1947, 8♂, M. Cazier & W. Gertsch, colls. [AMNH]; near Babicora, 5.7 mi. E. jct., road to Madera, VII-29-1984, 1♀, D. Daniels, coll.

#### *Callophrys affinis apama*

#### *C. a. homoperplexa blend*

#### NEW MEXICO:

**Los Alamos Co:** Burnt Mesa, Hwy 4 west of Los Alamos, Bandelier National Monument, 1♂, VI-20-1997, coll. ex larvae on *C. fendleri*, VI-22-1997 (emerged VII to IX-1997), 6♂, 2♀, G.A. Gorelick, coll.

**Sandoval Co:** Jemez Springs, 7000', V-25 to VI-13-1913, 9♂, 13♀; V-21-1921, 1♀; VI-2-1921, 3♀, all J. Woodgate, coll., Bandelier National Monument, 7000', VII-17-1999, 2♂, 2♀, S.J. Cary, coll.

#### *Callophrys affinis homoperplexa* Barnes & Benjamin

#### NEW MEXICO:

**Colfax Co:** Dale Mtn., 8400', Johnson Mesa, VI-21-1997, 1♂, S.J. Cary, coll.; Tolby Campground, Hwy 64, 7000', June 2, 1996, 1♂, 1♀, G.A. Gorelick, coll.

**Santa Fe Co:** Hyde State Park, 8 mi. NE. Santa Fe, 8700', Sangre de Cristo Mtns., VII-29 to 31-1964, 1♀, F., P., & M. Rindge, colls.; Chupidero Cyn., 8450', Sangre de Cristo Mtns., VII-23-1934, 1♂, M. Hebard, coll.

**Rio Arriba Co:** San Antonio Mtn., 9000', VI-21-1978, 3♂, J.A. Scott, coll.

**San Miguel Co:** near Hot Springs, 7000', Las Vegas, VII-1882, 1♂, 2♀, F.H. Snow, coll.

**Union Co:** Capulin Mountain National Monument, VI-28-1968, 1♀, no coll.

#### COLORADO:

**Larimer Co:** Horsetooth Mtn. Park, 5 mi. SW. Ft. Collins, V-6-1977, 1♂, J. Buchholz, coll.; VI-23-1985, 2♂; V-5-1985, 1♂, R.E. Stanford, coll.; V-30 to VI-8-1987, 5♂, P.A. Opler, coll.; VI-29-1997, 2♀, P.A. Opler, coll.; VI-29-1997, 2♂, G.A. Gorelick, coll.; Lory State Park, 5 mi. W. Ft. Collins, VI-8-1985, 2♂, P.A. Opler, coll.; VI-29-1997, 2♂, Andrew D. Warren, coll.; "A" Mountain on Horsetooth Res. Rd., VI-25-1995, 1♀, A.D. Warren, coll.; 4 mi. W. of Hwy. I-25 on Woodman Rd., VI-2-1992, 1♂, A.D. Warren, coll.

**Jefferson Co:** Apex Trail at Heritage Square, V-13-1990, 1♂; V-11-1991, 1♂; VI-6-1990, 4♂, A.D. Warren, coll.; Indian Hills, nr. Denver, VI-21-1936, 1♂, W.D. Field, coll.; Mother Cabrini Shrine, Hwy. 40 W. of Denver, VI-10-1961, 2♂; VI-14-1966, 1♀, R.J. Jae, coll.; VII-5-1965, 1♀, John A. Justice, coll.; V-26-1990, 2♂, A.D. Warren, coll.; Chimney Gulch, V-24 to 30-1907, 3♂; VI-8-1915, 2♂, E. Osler, coll. (from Barnes collection, incl. 1 *paratype*); VI-6-1937, 1♂; V-13-1938, 1♂, Bob Potts, coll.; Chimney Gulch, 1/4 mi. south, V-6-1966, 1♂, J.A. Scott, coll.; V-25-1927, 1♂, E.I. Huntington coll'n; VI-6-1937; Rooney Ranch, VI-17-1956, 1♀, R.J. Jae, coll.; Lookout Mtn., nr. Golden, 6500-7200', VII-8-1967, 5♂, 1♀; VI-11 to 18-1968, 7♂, 2♀, all Mike Fisher, coll.; Castle Rock, near Golden, V-21-1966, 1♂, J.A. Scott, coll.; \*Golden, V-24 to 30 (no year), 2♂; VI-8 to 15 (no year), 2♂; V-16 to 23 (no year), 1♂, V-24-1930, 1♂, all Barnes and

Benjamin (*paratypes*); Golden, VI-1910, 2♂, F. Skinner, coll.; V-28-1939, 2♀, C.C. Albright, C.D. Schryver, colls.; VI-11-1939, 1♂, C.C. Albright, coll.; V-2-1943, 1♂, C.D. Schryver, coll.; Clear Creek Canyon, V-8 to 15-1907, 1♂, Ernest J. Osler, coll.; Clear Creek, 6000-7000', VI-20-1922, 1♂, G.P. Engelhardt, coll.; VII-3-1984, 1♂, P.A. Opler, coll.; Red Rocks Park, 6000', V-11 & 25-1956, 2♂, R. J. Jae, coll.; V-24-1964, 1♂, 1♀, VI-4-1966, 2♂, J.A. Scott, coll.; Red Rocks Park, VI-10-1971, 1♂, R.J. Jae, coll.; Red Rocks Park, 2 mi. NW Morrison, VI-5-1968, 1♂, 1♀, Mike Fisher, coll.; Ralston Butte, V-23 & 24-1994, 23♂, 2♀; V-29-1988, 4♂; VI-10-1994, 2♂; VII-10-1985, 2♀, all J.A. Scott, coll.; Tinytown, V-26-1984, 2♂; V-15 to VI-25 (1984-94), 17♂, 7♀, all J.A. Scott, coll.; Tinytown (trail to Mt. Lindo), V-31-1993, 1♂, 1♀; VI-7-1992, 1♂; V-27-1991, 1♀; V-29-1989, 1♂; VI-9-1998, 1♂, all A.D. Warren, coll.; Lookout Mtn., V-29-1988, 2♂; VI-15-1995, 5♂, J.A. Scott, coll.; Indian Peak, V-14-1994, 2♂, J.A. Scott, coll.; El Dorado Mtn., VI-11-1994, 1♂, J.A. Scott, coll.; Zion, 2100m, V-28-1991, 1♂, C.P. Slater, coll.; Mt. Zion, V-30-1981, 1♂; V-14-1994, 2♂; V-26-1984, 2♀, J.A. Scott, coll.; VI-1-1990, 1♂, 1♀; V-28-1989, 2♂; V-30-1991, 1♂; V-28-1998, 2♂, A.D. Warren, coll.; Guy Hill, VI-18-1992, 1♀, J.A. Scott, coll.; Falcon County Park, V-30-1984, 1♂; VI-15-1989, 2♂; VI-6-1994, 2♀, J.A. Scott, coll.; Mt. Falcon, V-27-1994, 2♀, J.A. Scott, coll.; Tucker Gulch, VI-12-1982, 1♂, C.P. Slater, coll.; VI-15-1995, 1♂, J.A. Scott, coll.; Apex Gulch, VI-5-1990, 2♂; VIII-20-1990, 1♂; VI-20-1995, 4♂; V-19-1994, 1♂ V-29-1991, 2♂, all J.A. Scott, coll.; Coal Creek, VII-17-1991, 1♂, J.A. Scott, coll.; Green Mtn., V-10 and VI-3-1986, 2♂, J.A. Scott, coll.; Crawford Hill, VI-5-1980, 5♂, 1♀, J.A. Scott, coll.; N. Crawford Gulch/Canyon, V-30-1981, 1♂; V-24-1988, 1♂, J.A. Scott, coll.; Golden Gate Cyn., VI-12-1956, 1♂, Lincoln F. Brower, coll.

**\* Type locality of *C. a. homoperplexa*. Paratypes exist also from Boulder and Denver**

**Boulder Co:** Eldora, VI-15-1941, 1♀, P.S. Remington, coll.; Boulder, VI-20-1949, 3♀, J.C. Hopfinger, coll.; "July", 1♂, (*paratype*), no coll.; Boulder Canyon, VI-18 to 20-1933, 1♀, 1♂, P.S. & C.I. Remington, colls.; Mtns. No. of Boulder Cyn., VI-2-1965, 2♀, John Justice, coll.; Baird Park, Gregory Cyn., V-23-1965, 1♂, J.A. Scott, coll.; nr. Baird Park, Gregory Cyn., VI-7-1964, 1♀, VI-14-1965, 1♂, John Justice, coll.; V-4-1965, 2♂, V-12 to 19-1965, 6♂, J.A. Scott, coll.; Gregory Cyn., 5900', V-29-1954, 1♂; V-20-1966, 1♂, J. Don Eff, coll.; V-23-1962, 1♂; VI-3-1962, 1♀; V-19-1966, 1♂, J.A. Scott, coll.; V-1 to 6-1966, 8♂, 1♀, S.A. Johnson, coll.; V-20-1970, 1♂, R.J. Jae, coll.; V-4 to 23-1965, 1♂, J.A. Scott, coll.; IV-28 to V-30-1966, 21♂, 2♀, J.A. Scott, coll.; Cardinal Hill, VII-1-1957, 1♂, J. Don Eff, coll.; Sunshine Cyn., 7200', VI-1-1947, 3♂, V-28-1953, 1♂, all J. Don Eff, coll.; V-30-1962, 2♀, J.A. Scott, coll.; 1 mi. NW Nederland, VII-2-1989, 1♂, J.A. Scott, coll.; nr. summit, Flagstaff Mtn., VII-15-1975, 1♂, J. Vernon, coll.; Flagstaff Mtn., V-23-1948, 2♂; VI-19 to 21-1953, 2♂, all J. Don Eff, coll.; V-30-1961, 3♂, J.A. Scott, coll.; V-29-1951, 2♂, O. Buchholz coll'n; Four Mile Cyn., VI-17 to 19-1953, 4♀, 3♂; V-16 to 19-1958, 1♀, 2♂; VI-25-1965, 1♀; V-15-1966, 2♂, 1♀, all J. Don Eff, coll.; V-9-1959, 2♂, J. Don Eff, coll.; Four Mile Creek Cyn., nr. Crismon, V-16 to 24-1958, 6♂, 1♀; VI-5-1959, 2♂; V-2 to 17-1962, 4♂, 2♀, all J. Don Eff, coll.; Packer's Gulch, nr. Crismon, V-15-1966, 1♂, J. Don Eff, coll.; Lefthand Cyn., V-4-1932, 1♂; V-30-1951, 1♂, V-24-1953, 5♂; V-29-1954, 2♂, all J. Don Eff, coll.; VI-28-1952, 1♂, O. Buchholz collection; V-23-1962, 1♂; VI-9-1968, 1♂; VI-8-1994, 1♂, J.A. Scott, coll.; Magnolia Road, VI-13-1972, 1♂, J. Don Eff, coll.; 2 mi. SW Boulder, 6500', V-18-1963, 1♂, U. Lanham, coll.; Sugarloaf, V-30-1955, 2♂, J. Don Eff, coll.; V-20-1958, 2♀, E.R. Hulbirt, coll.; Iron Mtn., Sugarloaf Rd., V-13-1962, 1♂, J. Don Eff, coll.

**Denver Co:** Ruby Hill, 5390', V-25-1994, 1♀, R.E. Stanford, coll [GM-CSU]

**Gilpin Co:** No. Clear Creek, 7200', VII-2 to 7 (1977-8), 4♂, 1♀, J.A. Scott, coll.; VII-3-1982, 1♂, R.E. Stanford, coll.; East Portal, Moffat Tunnel, VI-19-1977, 1♂, J.A. Scott, coll.; Aspen Springs, 8900', VI-8-1985, 1♂, R.E. Stanford, coll.; Blackman Meadows Trail, 8400-8700', Golden Gate State Park, V-24-1975, 1♂, R.E. Stanford, coll.

**Gunnison Co:** Almont, VI-20 to 30-1925, 2♀, J.D. Gunder, coll.; One Mile Camp, 8 mi. NE Almont, 8200', VII-8-1957, 2♂, 1♀, F. & P. Rindge, colls.; 5 mi. W. Gunnison, 7000', VI-17-1966, 1♂, 1♀; Iola, 7600', VI-19-1967, 1♀; Curecanti Creek, 8000', VI-2-1962, 2♂, all Scott L. Ellis, coll.; Blue Mesa Reservoir, jct. Hwys 50 & 149, VI-4-1996, 3♂, G.A. Gorelick, coll.

**Logan Co:** County Road 9, 6.5 mi. N. of Ft. Morgan, chalk bluffs, V-28-2000, 1♂, 1♀, R.E. Stanford, coll.

**Morgan Co:** S/N scarp, Wildcat Creek, SR 52, 7-11 mi. N. of Ft. Morgan, V-28-2000, 4♂, R.E. Stanford, coll.

**Adams Co:** 1 mi. W. fairgrounds, 5100', V-25-1994, 1♂, R.E. Stanford, coll.

**Custer Co:** Davenport Camp, 36 mi. So. Florence, 8500', VI-30-1967, 3♂, 1♀, F., P., & M. Rindge, colls.; Silver Cliff, VI-29-1968, 1♂, J.A. Scott, coll.;

Washout Creek, VII-4-1967, 1♂, J.A. Scott, coll.; Smith Creek Campground, VI-13-1971, 1♀, J.A. Scott, coll.; 1 mi. E. Smith Creek Campground, Hwy 82, VII-28-1970, 1♂, J.A. Scott, coll.; VI-3-1996, 1♂, G.A. Gorelick, coll.; Bull Domingo Mine, VI-18-1973, 1♂, J.A. Scott, coll.; Ben West Hill, VI-12-1970, 1♂, J.A. Scott, coll.; 3.2 mi. W. of Wetmore, Lewis Creek Trail, VI-11-1991, 1♀, A.D. Warren, coll.

**Fremont Co:** 1 mi. So. Cotopaxi, VII-1-1969, 1♂, J.A. Scott, coll.

**Park Co:** nr. Antero Jct., 9300-9500', VI-23-1973, 1♂, R.E. Stanford, coll.

**Arapahoe Co:** Piney Creek, 6000', VI-2-1974, 1♂; VI-10-1979, 2♂, R.E. Stanford, coll.; Piney Creek, Smoky Hill Rd., 6700', VII-4-1965, 1♂, J.A. Scott, coll.; V-20-1993, 5♂; V-28-1993, 3♂; VI-5-1992, 1♂; VI-6-1992, 2♂; V-29-1994, 3♂, A.D. Warren, coll.

**Pueblo Co:** 2 mi. up Greenhorn Trail, Greenhorn Campground, VI-22-1967, 1♂, J.A. Scott, coll.; Greenhorn Trail, w. of Rye, VI-4-1971, 2♂, J.A. Scott, coll.; Beulah, VII-7-1899, 1♂, W.D. Kearfott, coll.; VI-12-1970, 4♂, J.A. Scott, coll.; 4 mi. NW Beulah, VI-29-1970, 1♀, J.A. Scott, coll.;

**Los Animas Co:** near Weston, VII-13 to 19-1975, 2♂, 1♀, J. Vernon, coll.

**Douglas Co:** Indian Creek Campground, VII-6-1995, 1♂, J.A. Scott, coll.; Mitchell Gulch @ Founders Village, 6400', VII-31-2000, 3♂; Surrey Ridge, VII-17-1989, 1♂; Hidden Pointe area, ca. 8 mi. NNW Castle Rock, VI-13-1998, 1♂; VII-4-1998, 1♀; VI-11-1998, 1♂; VI-6-1998, 1♀; VI-18-1998, 2♂; VI-7-1998, 1♀; VII-16-1998, 1♂; VI-24-1999, 3♂, 2♀; Newlin Gulch, ca. 8 mi. NNE Castle Rock, VI-28-1999, 2♂, 1♀; VII-17-1999, 4♂; canyon N. of Palmer Lake, VII-29-2000, 1♂; Daniels Park, VII-12-1998, 1♂, 1♀; V-31-1998, 1♂; McMurdo Gulch, 3 mi. NE of Castle Rock, VI-17-1999, 2♂; Hunt Mountain, ca. 6 mi. S. of Castle Rock, VII-24-1999, 1♂; VII-11-1999, 2♂; VI-26-1999, 3♂, 1♀; Wolfensburger Road, ca. 2 mi. W. of Castle Rock, VI-19-1999, 3♀; mouth of Jarre Canyon, VI-4-1998, 1♂, all A.D. Warren, coll.

**Elbert Co:** Running Creek Field Sta., 6950', T9S, R65W Sec 26, SE 1/4, VI-25-1976, 1♀, S. Condie, coll.; Pohl Ranch, 6850', T6S, R65W, Sec 26, SW 1/4, 1♂, no coll.; near Elbert, 7000-7400', VI-26-1976, 1♂, R.E. Stanford, coll.; south side of County Line Rd., 6.2 mi. E. of Gun Club Rd., VI-10-1993, 3♂, A.D. Warren, coll.

**Teller Co:** 4 mi. SW. of Florissant, VI-26-1989, 1♂, 1♀, A.D. Warren, coll.; Florissant Fossil Beds, 8550', R70W, T13S, Sec 30, Maytag, VI-22-1976, 1♂, S. Condie, coll.

**Ouray Co:** 4 mi. N. Ouray, 7400', VI-5-1966, 1♂, F. M. Brown, coll.

**El Paso Co:** Mt. Hermon Mon. Area, 7500', VII-8-1956, 4♂, no coll.; Star Ranch, VI-26-1931, 1♂, F.M. Brown, coll.; VI-27-1965, 1♂, no coll.; 4 mi. W. of Hwy. I-25 on Woodman Rd., VI-2-1992, 1♂, A.D. Warren, coll.

**Chaffee Co:** nr. Mt. Princeton Hot Sprs., Hwy 162, 7500', VI-20-1966, 1♂, 1♀, Scott L. Ellis, coll.; 1 mi. WSW of Buena Vista, VI-13-1992, 2♂, A.D. Warren, coll.

**Dolores Co:** West Fork Camp, 20 mi. NW Dolores, 7800', VI-30-1957, 3♂, F. & P. Rindge, colls.

**Clear Creek Co:** Fall River Rd., 2 mi. W. Idaho Sprs., 7500', VI-4-1967, 1♂; VI-3 to 8-1968, 2♂, Mike Fisher, coll.; Clear Creek, 7000-8000', V-27-1979, 1♂, R.E. Stanford, coll.

**Montrose Co:** Alpine Trail Rd., VI-22-1973, 1♂, no coll.; north rim, Black Canyon National Monument, 7809', VI-30-1967, 1♂, 2♀, Scott L. Ellis, coll.

**Lincoln Co:** N. microwave tower, 6.5 mi. W. CO Hwy 71, 5850', VI-30-1993, 1♀, R.E. Stanford, coll.; CO Hwy 71, 5400', 21.6 rd.mi. N. Limon, Li/Wa Co. line, VI-30-1993, 1♂, R.E. Stanford, coll.

**Archuleta Co:** NE of Pagosa Sprs., June 30, 1965, 1♂, sight record, J.A. Scott

**Saguache Co:** County Road 31 above Vulcan, west slope portion of county, VI-16-2001, 2♂, Michael S. Fisher, coll.

***Callophrys affinis albipalpus* ssp. nov.**

**NEW MEXICO:**

**Lincoln Co:** Cedar Creek Camp, 5 mi. N. of Ruidoso, 7000', Sacramento Mtns., VI-30-1961, 2♂, F., P., & J. Rindge, colls.; New Mexico State University's Montgomery Biological Research Laboratory, 5 mi. n. of Ruidoso, 7000', Sacramento Mtns., VII-26 to 28-1978, 2♀, VII-21 & 22-1980, 2♀, all Greg Forbes, coll. (R.W. Holland collection.); VII-4-1981, 2♂, 4♀, G.A. Gorelick, coll.; VI-28-1982, 1♂, ex ovum (Emgd: IV-27-1983); VII-1982, 7♂, 7♀, ex ova reared on lab host, *Eriogonum grande rubescens* (Emgd: VIII-1982)

***Callophrys affinis chapmani* ssp. nov.**

**MEXICO:**

**Sonora:** Mun. Nacori Chico, 7300', 11.6 mi. N. of Mesa Tres Rios and 44.9 mi. so. of Huachinera, 108 49'W, VII-2-1979, 1♀, R.W. Holland, coll., 13.7 mi.

N. of Mesa Tres Rios and 42.8 mi. S. of Huachinera. 7600', 105 49'W, VII-2-1979, 1♂, R.W. Holland, coll.

**Durango:** El Salto, 27.7 mi. E., 8000', VII-18-1964, 1♀, J.A. Powell, coll.; VII-11-1981, 1♀, R.W. Holland, coll., VII-15-1981, 1♂, 1♀, G.A. Gorelick, coll.; VIII-5-1981, 1♀, G.A. Gorelick, coll., VII-10/11-1983, 2♂, 4♀, G.A. Gorelick, coll., VII-15-1983, 2♀, G.A. Gorelick, coll.; 13 mi. E. El Salto, Hwy. 28, 8000', VII-10-1983, 1♀, G.A. Gorelick, coll.; Mun. Llano Grande, 16-17 mi. E. El Salto, Hwy. 28, VII-13-1985, 2♂, 3♀, coll. ex ova on *Eriogonum atrorubens* (Emgd: VIII-28-1985) G.A. Gorelick, coll.; 16.3 mi. E. El Salto, Hwy. 28, IV-14-1986, 1♀, Greg Ballmer, coll. ex larva on *Eriogonum atrorubens*.